The Journal of Occupational Diseases and Traumatic Surgery

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 9 MAY, 1940 Number 5

FELLOW MEMBERS:

We who have been active in industrial medicine are approaching a milestone of outstanding significance: the Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons, to be held in New York City, June 6 and 7, 1940.

Heartening evidence of the ever-widening compass of the field is the fact that the newly organized American Industrial Hygiene Association will hold its First Annual Meeting in New York on June 4 and 5. This combined four-day session provides a too-good-to-be-missed opportunity for a thorough survey of our own specialty as well as those closely related.

A TRIP TO REMEMBER! That's what attendance at this year's convention offers us all. If you're one of the lucky ones who can get away early enough to see something of your friends before the sessions begin, and if you can stay over for the A.M.A. meeting the following week, you should be able in your spare moments to look over the 1940 New York World's Fair.

I hope I shall have the pleasure of seeing you at the Hotel Pennsylvania early in June.

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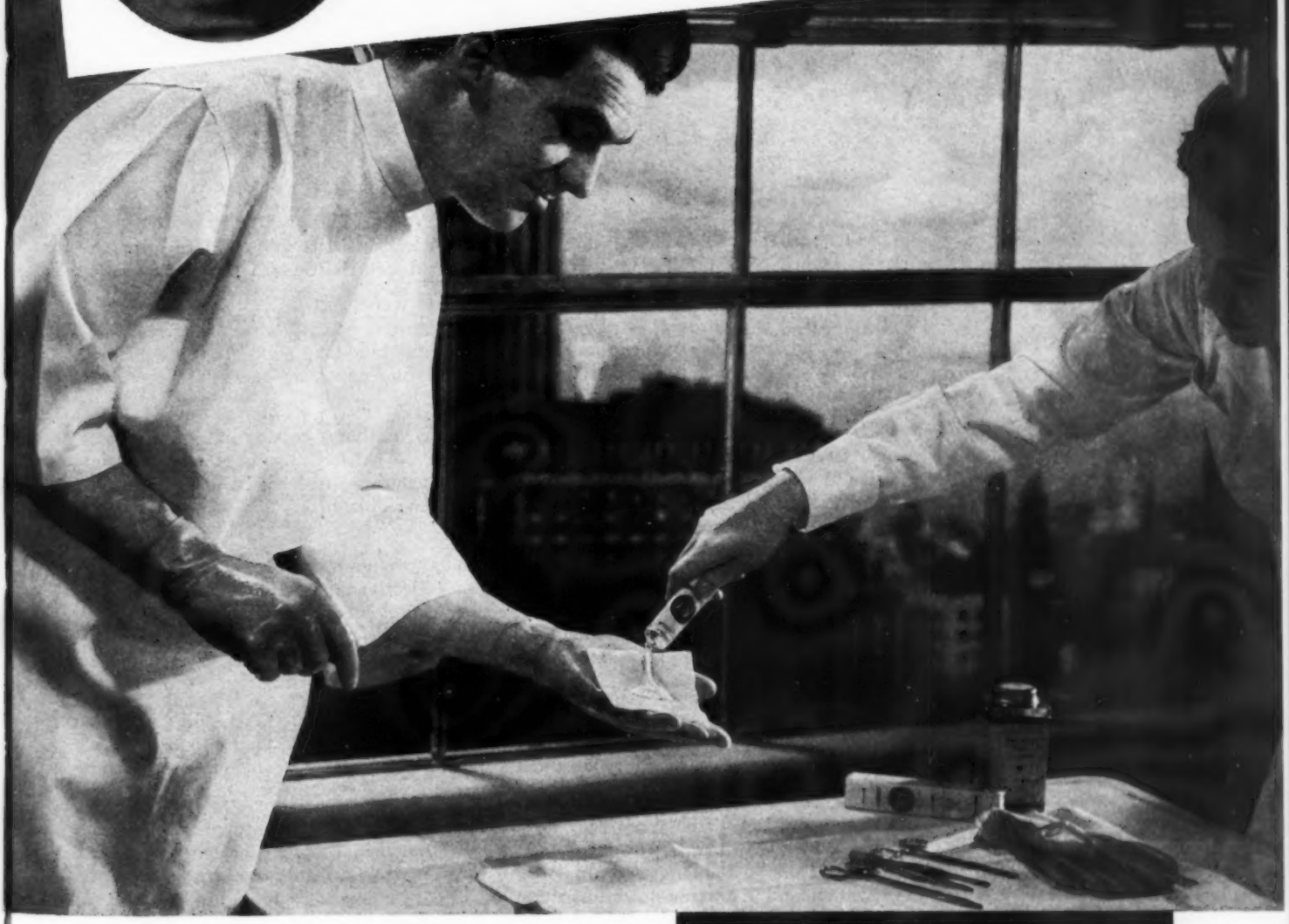

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INDUSTRIAL HEALTH AND DISEASE:
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(Air Hygiene Foundation)

DR. KLAUDER'S "Dermatitis Control" was first given in substance at the Twenty-Eighth National Safety Congress last Fall, was then revised for publication under a different title in *Arch. Dermat. & Syph.* in February of this year, and now, with the exception of the formulas, which are unchanged, was again rewritten for its appearance here. It is a magnificent article. And it comes at a time when "cleansing agents, soaps and other detergents" are receiving maximum attention. « » DRS. GORDY and TRUMPER bring us a material addition to the literature on "Carbon Disulfide Poisoning" (page 231), a subject on which, as they remark, "knowledge . . . is in its infancy." « » DR. BERGHOFF (page 235) can be sure of the wish expressed in his talk to the New York Central Surgeons, at their November Annual Meeting, when he closed with: "I hope you have liked it." They did, and we have been asked many times when it would appear in print; there was so much more in it than could be obtained from hearing, that the inquirers wanted the opportunity to go over it again. Here it is, and we are confident that our readers who didn't hear it will also like it, and that those who heard it will like it even more. « » MISS PAZOUREK writes interestingly of "The Industrial Nurse as a Teacher of Nutrition" (page 240). No problem the industrial nurse encounters is more important than that of under-nutrition, and, as MISS PA-

—Continued on page 5.

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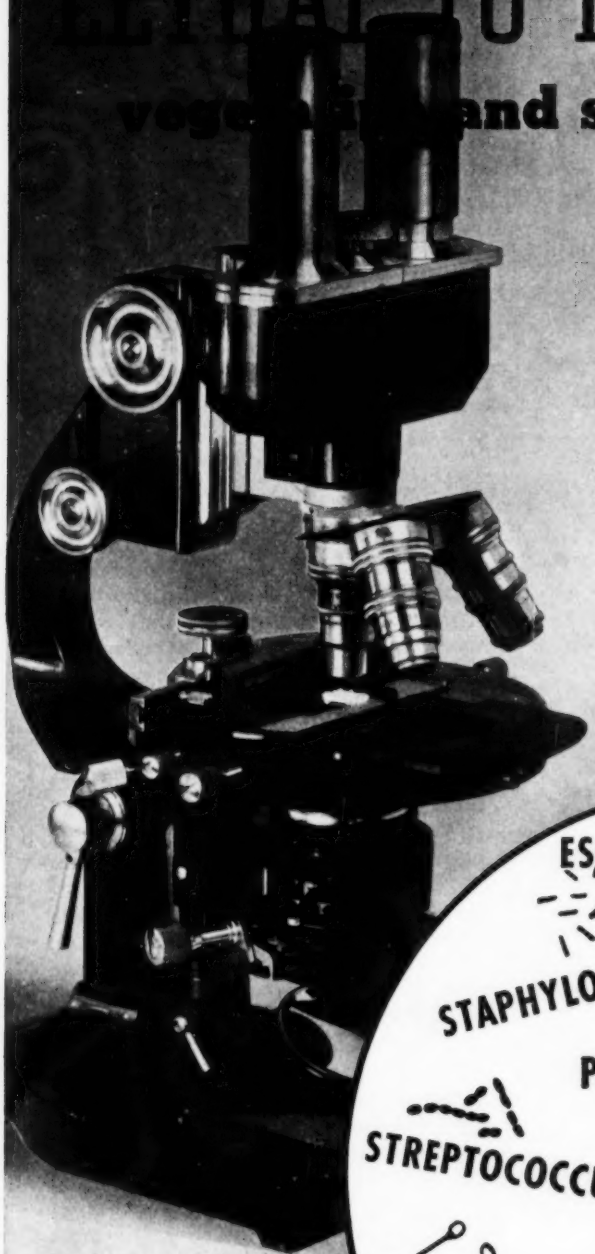

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ZOUREK indicates, the nurse is in a better position to urge, and assist in, its solution than any other employer agency. « » "Fatigue and Employment" (page 243) was prepared by DR. ROY R. JONES, and he had planned to read it at the Cleveland meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS last June. But he was unable to be present on account of illness, and the paper was read by DR. R. R. SAYERS. Then, a few days later, came the news of DR. JONES' untimely death. His name here affirms what none of the host who knew him needs to be reminded of — that he is still missed! « » DR. HALL has a habit of getting much into little. His "Organic Nervous Disease" (page 246) is a capsule in size, but, in effective content, expands on reading into many times the volume of its words. « » DR. RYERSON'S "Conservative Treatment of Fractures" (page 247) may have been "informal," but it is another of those gems of long experience which makes his allotted time upon a program something not to be missed. « » DR. CAROTHERS writes interestingly and instructively of "The Principles Involved in the Operation for Internal Fixation of Fractures of the Neck of the Femur" (page 249). « » DR. HANSEN begins his "Treatment of Burns" (page 251) with a reference to the subject as prolific of study and discussion. His article, however, is more than a mere addition to the many written. It has a definite value and a powerful persuasiveness toward the end he urges — "a standardized method of treatment." « » DR. LAKE (page 254) discusses the very prevalent problem posed in the question: "Why should industry be interested in the control of illness?" He answers the question, leaving no doubt that industry should be interested, and concluding: "An industrial medical department is a health department. Its purpose is to prevent illness." As to the general "Why," from, perhaps, the executive, more than the medical standpoint, a sentence in a current review of DR. C. O. SAPPINGTON'S latest book "Industrial Health — Asset or Liability" (*J.A.M.A.*, April 27, 1940) puts it tersely thus: "It is interesting to learn that the sources of the most costly kind of illnesses among employees are largely non-industrial but the effects are industrial." « » DR. BENNETT advises regarding the "Acute Traumatic Abdomen" (page 256). « » THE CENTRAL STATES PROGRAM (page 259), to be given May 21, at Peoria, Illinois, is alluring, particularly in its morning session feature of 10-minute reports, followed by discussions, on a variety of subjects. The four illustrative case histories in

—*Continued on page 12.*

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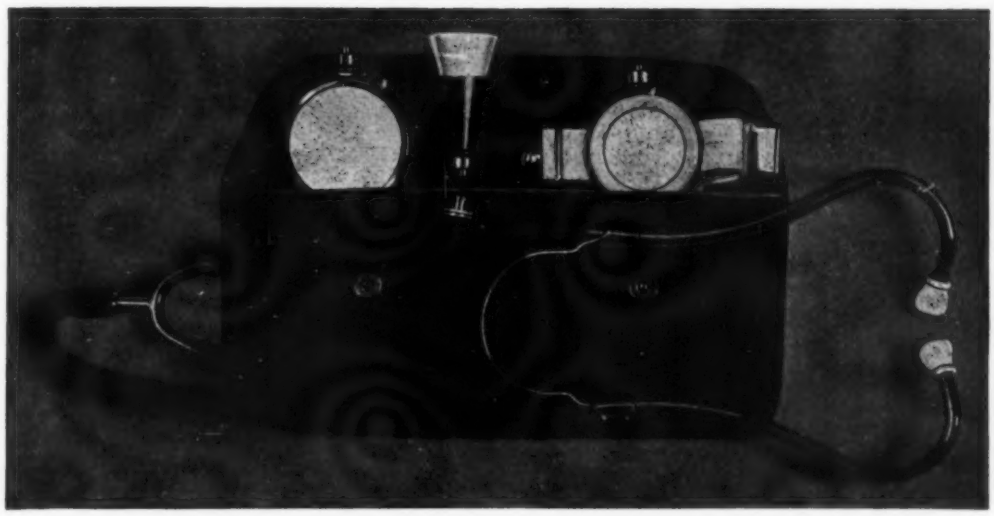

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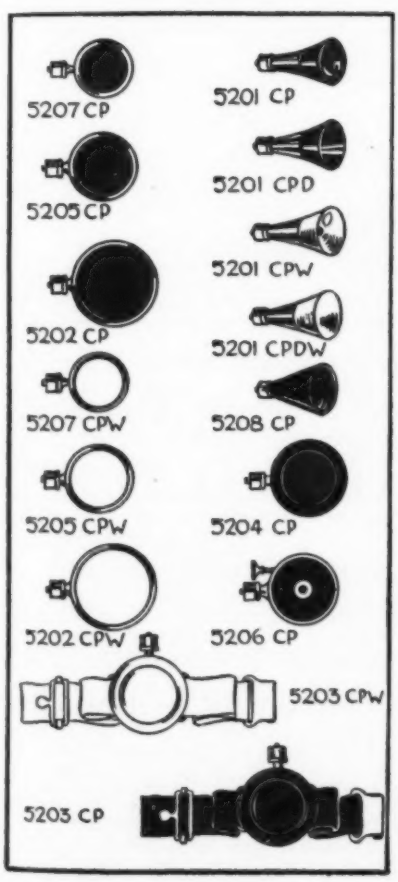

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—Continued from page 5.

DR. SAPPINGTON's "Medicolegal Typing of Occupational Disease Cases," the opening presentation, will cover: (1) employment exposure positive, occupational disease with resulting disability; (2) employment exposure negative, previously existing occupational disease with resulting disability; (3) employment exposure negative, no occupational disease, but disability caused by non-occupational disease; and (4) negative employment exposure, no occupational disease, and no disability — indicating that the problems of disabilities from, and costs of, occupational diseases involve much more, from the employer's point of view, than merely sickness due to occupation. « » THE Programs of the First Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION and the Twenty-Fifth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS (pages 259-261) in New York City, June 4, 5, 6, and 7, have been the subjects of intensive work on the part of all the Convention Committees. Attention is called to the Program of Social Activities on page 284. « » DR. MARKUSON's "Industrial Medicine and Industrial Hygiene" (page 261) opens with a very fine definition of "industrial health," and emphasizes again the superlative possibilities of close cooperation between the physician and the engineer. « » DR. NEWELL presents a valuable study of "Chronic Bone Infections," (page 265), with case histories. « » AIR HYGIENE's "Proposed Plan for the Recording of Industrial Absenteeism" (page 272) shows how the statistics of this important matter can be efficiently developed. « » AND DR. BLOSSER closes this session with "Problems in Industrial Medicine — Some Social and Economic Aspects" (page 276). DR. BLOSSER read this paper at a meeting of the Multnomah County Medical Society, Portland, Oregon, last October, and it was published in *Northwest Medicine* last month. We republish it here because its forthright treatment of problems universal under present methods is deserving of universal reading. « » WE learn, as we go to press, that DR. R. R. SAYERS, known to our readers as Chief, Division of Industrial Hygiene, National Institute of Health, has been transferred to the Bureau of Mines as Acting Director. It is a good time to quote from a little article entitled "Unsung Heroes of Public Service" in *The Reader's Digest* for February, 1939 (p. 33). It was written by Albert W. Atwood, and it said: "DR. ROYD RAY SAYERS, in charge of industrial hygiene and sanitation for the U. S. Public Health Service, has done as much for working men as any labor leader whose name and fame fill the papers. He is the key man in the rapidly growing movement to prevent and cure occupational diseases. Hard-rock miners, hatmakers, furriers, cement, clay and pottery workers, photo-engravers, rayon workers, cigarmakers, textile workers and an army of men and women in other occupations have reason to bless a name they never have heard. He is the leader in discovering the best way to deal with the hazards of their daily jobs and he is the most influential man in getting preventive measures adopted. In this chemical age, new hazards are constantly being created by new processes. Dr. Sayers has done a great deal of original study of poisoning from gases, of caisson diseases, of silicosis and lead poisoning. Largely due to his efforts,

—Continued on page 14.

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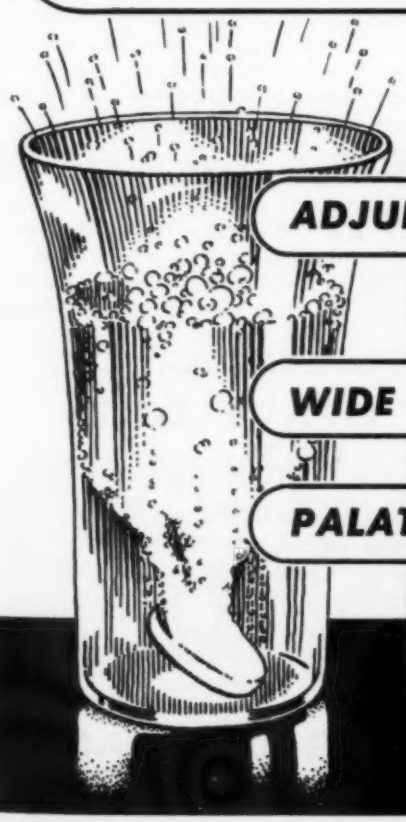

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—Continued from page 12.

state after state has set up an industrial hygiene bureau. He keeps in close touch with local health officers, industries, and labor organizations. . . . For some years he was lent to the Bureau of Mines to study prevention and cure of mining diseases. When he started, little work of the kind was being done. Now he heads 90 research workers in a big laboratory at Bethesda, Maryland, just completed. . . . He has been offered large salaries by insurance companies, but he prefers to stay where he is, as one of the unseen men who, regardless of the political kaleidoscope, carry on the important day-to-day work of government." We hope DR. SAYERS' new interest will not too much require his withdrawal from among those of us who do know what he is, and what he has done!

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*Archives of Dermatology & Syphilology—39:811:1939.

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The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 9 MAY, 1940 Number 5

Dermatitis Control

—*Proper and Improper Use of Cleansing Agents, Soap and Other Detergents*—

JOSEPH V. KLAUDER, M.D.,
Philadelphia, Pennsylvania

THERE are two aspects to be considered in preventing industrial dermatitis. One is essentially an engineering problem and concerns such measures as mechanical devices to replace manual contact, exhaust systems, closed processes, clean protective clothing, shower bath facilities, general department sanitation, and hygienic practice of the worker. These measures are in effect in the larger factories with a safety engineering department. They are more likely lacking in the smaller factory or workshop. This aspect will not be discussed.

The foregoing measures prevent or minimize contact of the skin with irritating, sensitizing, or soiling substances which make unnecessary the use of harmful cleansing agents. Until industry is more mechanized, the second aspect in prevention of industrial dermatitis will remain important. This aspect, the purpose of this paper, is concerned with all protective applications to the skin other than mechanical — protective hand creams, neutralizing solutions, improper methods of cleansing the skin, the use and abuse of soap, the use of soap substitutes, and the use of emollients. In short, with all medicinal protective and cleansing "skin saving" measures in the absence of mechanical "skin saving" measures.

For the purposes of this study I questioned a considerable number of patients and other persons engaged in industry as to the manner in which they washed their hands, the kind of soap used and by whom furnished (employer or employee), the frequency of washing, and the use of agents other than soap to remove foreign substances from the skin. In addition, I visited plants and workshops, and conferred with plant physicians and safety engineers to obtain this information, and to observe washing facilities and measures other than mechanical in dermatitis prevention.

Some observations are herein reported as illustrative cases. These concern the harmful methods commonly employed to cleanse the skin and other abuses to which the skin is subjected. It was apparent, especially in the smaller factory or workshop, that the worker employed his own method of removing foreign material from his skin. Such method was invariably improper. There was lack of instruction as to proper methods of cleansing the skin. There was an apparent indifference or lack of interest on the part of those concerned as to the cleansing methods employed by workmen. The plant physician, the safety engineer, the superintendent, and the foremen should not neglect interest in what appears to be a minor consideration, the method used by employees to cleanse their hands. The role that cleansing agents play in causation of industrial dermatitis has been emphasized by a number of writers. "It is worthy of emphasis that an enormous number of cases of trade dermatitis are caused annually, not by the substances encountered at work, but by their removal by methods harmful to the skin." (Overton.[1]) In Downing's[2] study of 2,000 cases of cutaneous disease arising in industry, in at least 249 cases soap and water constituted a contributory factor in the production of an eruption. Horner[3] remarks that he has seen more dermatitis due to the improper use of cleansing agents than to contacts in the occupation. Neal and Emmons[4] in reporting studies of dermatitis among plate printers state, "The proper method of cleaning the hands is one of the most important factors in preventing industrial dermatitis of the hands, and the fullest cooperation of individual plate printers is necessary."

Safety engineers with whom we conferred had a proper concept of the problems involved in prevention of industrial dermatitis. The important

considerations are: The education and instruction of the worker himself and others concerned in proper methods of cleansing the skin. Proper cleansing agents, in order to insure their use, should be furnished the employee and also necessary accessories such as clean wiping material — cheesecloth, waste, tissue or paper towels and emollients. Harmless cleansing agents herein discussed are inexpensive and are as quick in action and as convenient to use as are harmful methods. As a rule, the more harmful the cleansing agent the quicker is its cleansing action. In certain occupations, therefore, in order to facilitate proper cleansing methods, employees should be allowed to stop work a short period in advance of the usual time (Case 9, page 230).

Protective Medicinal Applications

IT SHOULD be emphasized that protective medicinal applications, so-called protective hand creams, are really a "makeshift." They cannot take the place of gloves or of mechanical measures of protection. In the absence of the latter, or when gloves cannot be worn, protective hand creams are indicated, since they are to some degree effective. As a matter of fact, workmen dislike gloves. There are many disadvantages to their use. They are usually not worn unless imperative — exposure to powerful skin irritants.

The use of simple agents such as cold cream (see Case 9), hydrous wool fat (lanolin), petrolatum, glycerine, indeed any bland oil or grease or even talc, or a combination of these such as equal parts of zinc oxide ointment and olive oil, or lanolin and glycerine, afford some degree of protection and have been recommended by many writers. Such simple agent, I believe, can be improved by the addition of ingredients that leave a protective film or by a combination of such ingredients in more appropriate vehicles adapted to different work.

Protective applications to the skin and harmless cleansing agents as a means of preventing industrial dermatitis have not received the scientific study that is merited. Few formulas have been published. The following have been recommended:

James[5]	Ivory Soap Flakes	7.48
	Glycerin	26.4
	Sodium Silicate	24.2
	Tragacanth	.21
	Oil of Lemon	.16
	Water	41.6
Fantus[6]	Zinc Stearate	8.0
	White Wax	4.0
	Spermacetti	12.0
	Wool Fat	8.0
	White Petrolatum	48.0
	Rose Water	20.0
	Oil of Rose	.02
Collis[7]	Mineral Lard	3 pounds
	Paraffin Molle	6 ounces
	Cyllin	3 ounces

There are a number of commercial preparations available in this country. The ingredients of many of these preparations are not given and the manufacturer is loathe to divulge their content except in a general way. No scientific study can be made of a preparation if the ingredients are not known. At least to the dermatologist it is desirable to know what is being applied to the skin. Ingredients should be avoided which may sensitize the skin (allergenic substances). Of the commercial preparations I do not believe there is a sufficient range of preparations for selection depending upon the nature of the work.

The active ingredient (substance that leaves a film on the skin) in the commercial preparations is either paraffin, wax, gum, sodium silicate, or casein. Many of these preparations contain soap. We do not regard this as desirable. Soap is apparently added to facilitate the removal of the preparation by washing. This, however, is not a valid advantage. As is later discussed, objections to soap as a detergent are its alkalinity which interferes with the normal acid reaction of the skin and its drying action. Prolonged exposure of the skin to soap is not desirable. Moreover, protectives containing soap break down in contact with weak acid or salts, with separation of fatty acid or insoluble soap.

It is desirable that the protectives be neutral or on the acid side to correspond with the reaction of the skin (pH about 5). In certain industries "neutralizers" could be added that are applicable to the nature of the work.

IN THIS study in which different formulas of protective applications are proposed I endeavored to fulfill the following requirements desirable for such preparations. They should be sufficiently adherent so that they are not too easily rubbed off, yet possible to remove at the end of the work day. They should not be too greasy or sticky and should not dry the skin. Ingredients should not be irritating and should have no or a very low allergenic capability. A choice of applications of a greasy, non-greasy, or waterproof character, should be available as the nature of the work demands.

In selecting ingredients all substances were concidered that leave an impervious coating or film that would be appropriate for use on the skin. This included rubber (latex), rubber compounds, synthetic rubber, various guttas, vegetable gums, glues, resins, paraffine, beeswax, silicic acid and its compounds, casein, agar, cellulose, and its compounds, and the newer plastics — artificial resins such as alkyd and vinyl resins.

From this list the following formulas were selected and subjected to clinical trial.

GROUP 1: This comprised petrolatum or benzoinated lard stiffened either with paraffin, beeswax, hydrogenated cotton seed oil, synthetic wax —glyceryl monostearate to which was added one or more of the following: Sodium silicate, latex, acacia, glycerine, lanolin, sulphonated olive oil. From this group the following ointments were selected, since they were not too greasy or too stiff:

1. Petrolatum	70. %
Hydrogenated cotton seed oil	30. %
2. A modification of simple ointment U.S.P.	
White wax*	5.0%
Glycerol monostearate (Xerol A)**	12.5%
Commercial solution of sodium silicate	5. %
10% solution of ammonium hydroxide***	0.5%
Petrolatum	72.5%

* The wax employed in this and all other formulas was white wax U.S.P.
** Xerol A. (Fries Bros.)
*** The ammonium hydroxide is incorporated to prevent precipitation of sodium silicate.

3. The preceding preparation is enhanced by the addition of 5% (by weight) of latex, which produces a rubbery film on the skin. The base is melted, latex is added while stirring, which is continued until congealed.

4. The following preparation has a pH of 5.4 and is therefore recommended when there is prolonged contact of the hands with soapy water:

Wax	10. %
Lanolin	5. %
Glycerol monostearate (Xerol A)	12.5%
Stearic acid	2. %
Petrolatum	75.5%

5. The following preparation to "waterproof" the skin is recommended when there is prolonged contact with water:

Wax	10%
Lanolin	5%
Sulphonated olive oil*	10%
Petrolatum	75%

* The type known commercially as 75%.

GROUP II: The following formula and also 7 and 8 are clean, non-greasy preparations that dry on the skin and do not rub off. Their use is indicated therefore in dry work, as a protection against dust borne irritants, or when soiling of material or objects by the protective is not desirable. Formula 6 is smeared on the skin, whereas 7 and 8 are liquids and are applied by means of a brush or swab.

6. Glycerol monostearate (Xerol A)	12. %
Wax	12. %
Anhydrous lanolin	6. %
Cholesterol	1. %
Commercial solution of sodium silicate	5. %
10% solution of ammonium hydroxide	0.5%
Water	63.5%

Melt wax, xerol, lanolin, and cholesterol in one pot. Add sodium silicate solution and ammonium hydroxide solution to water previously heated in another pot. Stir aqueous solution into the wax mixture.

Formulas of mastic solution in acetone that dry leaving a film on the skin:

7. Ethyl cellulose	5%
Mastic (NF)	8%
Castor oil	1%
Acetone (technical)*[1]	qs.
8. Polyvinyl acetal resin (Monsanto)	5–10%
Castor oil	1%
Acetone (technical)*[1]	qs.

Use whole mastic not the powder. Allow mastic to stand in acetone over night. Use supernatant fluid of the 20% mastic in acetone solution as a solvent for the other ingredients.

*[1] The more expensive CP grade could also be used.

In formula 7 we regarded ethyl cellulose* as more desirable than pyroxylin or myrrh, the use of which was studied. In formula 8 an alkyd resin (Rezyl 19, American Cyanamid and Chemical Co.) was not superior to the vinyl resin employed. Both preparations are not entirely removed by washing, the residue, however, is readily removed by acetone. If the latter is employed, an emollient should be used, especially in winter (see emollients page 225).

GROUP III: A thick paste that leaves a "water proof," impervious covering.

9. Zinc oxide	25%
Kaolin	25%
White petrolatum	50%

This preparation affords more protection than any of the other formulas. Its use is indicated when maximum protection (that is possible in a medical protective) is desired, for example in exposure to weak acids or alkalies when the use of rubber gloves is not imperative. It should not be expected to displace rubber gloves in exposure to strong irritants. It also "waterproofs" the skin and could be used in work necessitating prolonged exposure to water as well as to dust or mist (spray) borne irritants. Compared with other formulas, especially 4 and 5, also recommended when there is prolonged contact with water, it is less greasy, more sticky, produces a thicker coating on the skin, and soils objects in contact with it, since it rubs off to some degree.

Other (Pre-Work) Protective Applications to Skin

LOCAL application of anhydrous wool fat (lanolin) is effective in preventing cancer of the skin experimentally produced in laboratory animals by repeated application of carcinogenic agents, notably pitch. It has therefore been recommended that anhydrous lanolin, or what is better, mixed with an equal part of olive oil, be applied to the exposed skin of workers handling carcinogenic oils, tars, and most of their products before commencing work. At the end of the work day it is advised that the soiled skin be thoroughly washed with soap and water and lanolin again applied.

In prevention of dermatoses of workers in petroleum and lubricating oils, personal cleanliness and frequent washing are essential. In addition a variety of pre-work applications have been recommended: Castor oil, since it is impervious to paraffin (Scott[8]), greaseless creams and the application of equal parts of boric acid solution and alcohol before and after work (Downing[2]), lanolin or equal parts of lanolin and castor oil (McConnell[9]), dusting the arms with equal parts of starch and powdered zinc oxide,[10] Dakin's solution (diluted solution of sodium hypochlorite U.S.P.) applied before and after work (Bridge[11]). This measure is doubtless directed against some infectious agent in the oil, although this cause of oil dermatosis is questionable.

* Dr. James H. Sterner of the Medical Department of Eastman Kodak Co. informed us that from an extensive experience with workmen exposed to ethyl cellulose, this chemical has a low sensitizing capability.

It is advisable that workmen whose hands and forearms become very soiled apply before commencing work either olive oil, neatsfoot oil, or linseed oil. One of these oils mixed with an equal quantity of lanolin would be more adherent and therefore preferable. Such application facilitates the removal of dirt, grease, and any substance that stains or adheres to the skin, especially if one of these oils be applied again to the soiled parts and removed with clean wiping material (cheesecloth, cotton, tissue towel, etc.) before washing with soap and water. For this purpose Horner[3] employed cotton seed oil on the hands of workers exposed to paint or printing ink and McConnell[12] advised equal parts of olive oil and lanolin. McConnell concluded from his studies that the mechanical removal of ink by brush was responsible for the initiation of dermatitis among printers and not adulterants of oil of turpentine.

The application of hydrous lanolin containing 10% sodium bicarbonate is recommended in prevention of dermatitis from wood preserving materials in which coal tar distillate, water gas tar, and zinc chloride are the causative agents.

The application of pine tar to the hands of "beamers" and other workers in tanneries is a trade remedy. (See Case 8.) There is no scientific basis for this practice.

A solution of sodium bisulfite is valuable as a pre- and post-work application. It is non-irritating and has a low sensitizing capability. It can be employed as an alkaline wash to neutralize acid reacting chemicals, as a reducing agent, and as later discussed to remove dye, paint, and other stains. It reduces chromic acid and chrome compounds to the non-irritating chromous state and should therefore be used as a wash before and after exposure to these chemicals. White[13] recommends as a general rule that a concentrated solution be allowed to dry on the skin before exposure and a strong solution as a wash after exposure. He recommends as a general rule that in all industries involving exposure to chemicals, dyes, drugs, coloring materials, irritating dusts, or fluids, the hands be swilled in a solution of sodium bisulfite preparatory to the ordinary washing and after use of the commonly employed mixture of soda ash and hypochlorite of lime to remove dye stains.

Neutralizing Solutions: Post-Work Applications

CONSPICUOUS in our experience with patients with industrial dermatitis and in our visit to factories and workshops was the custom of industrial workers to use as a hand cleansing agent or to remove dye, paint, or other stain, such solvent or chemical that is used in their work. (Cases 2, 3, 4, 5, 7.) Such cleansing agents are potentially harmful, since they are either primary skin irritants, sensitizing (allergenic—turpentine for example) or defatting (drying) substances. Such cleansing agents usually employed are: Turpentine, alcohol, wood alcohol, naphtha, acetone, amyl acetate, gasoline, kerosene, benzine, various acids, alkalies, sodium carbonate (soda ash), potassium carbonate (salts of tartar), and hypochlorite of lime. Workers whose hands become stained with paint, varnish, or lacquer invariably use turpentine, paint thinner, or a solution of sodium carbonate (soda ash). Machinists use kerosene and auto mechanics gasoline. Printers, type setters, and lithographers employ "type wash," turpentine, kerosene, gasoline, or potassium carbonate. Employees in dye houses, "seasoners" in tanneries, indeed in any occupation where coloring material is handled the common practice is to remove the dye or stain with a bleaching solution—hypochlorite of lime or soda. The following is a trade formula: one pound each of sodium carbonate and hypochlorite of lime to three gallons of water. This amount or less of sodium carbonate alone may suffice.* If hypochlorite of lime or soda is employed, the minimum strength solution that suffices to remove the dye should be used followed by a liberal rinse in running water and immersion of the hands or forearms in a solution of sodium bisulfite.

A harmless yet efficacious method of removing dye or other stain is the free application of a 10% to 30% solution of sodium bisulfite. If it does not suffice, it should be used after the application of 1-4000 solution of potassium permanganate.

Another harmless method of removing paint, dye, and also oils and greases is the application or the immersion of the hands in 1% to 2% commercial solution of sodium silicate. One-half to 1% solution of metasilicate could also be employed and would probably be superior. These chemicals should be considered in the removal of any foreign substance from the skin and as a general cleanser (see Silicates of Soda page 227 and Soap as a Primary Skin Irritant page 228).

The application of a paste of magnesium carbonate is a harmless method of removing stains from the skin caused by picric acid (trinitrophenol).

The harmful action on the skin of irritating substances may be eliminated or greatly minimized by a liberal rinse in running water immediately following exposure.

It is advisable to rinse or immerse the hands in neutralizing solutions during and after exposure to acids and alkalies. The following non-irritating solutions can be used. For acids a saturated solution of either sodium bicarbonate, sodium borate, or lime water and for alkalies a 3% solution of acetic acid or a saturated solution of boric acid.

In an attempt to prevent dermatitis from contact with developing solutions at Eastman Kodak Company, Dr. B. J. Slater,[14] Medical Director, Eastman Park Works, informed me that a rinse of 1% to 3% solution of acetic acid is employed after exposure, followed by copious water rinse.

As mentioned in the aforegoing, the application of a bland oil—olive, cotton seed, neatsfoot oil,

* Although it is a good general principle to use the minimum strength solutions of alkaline cleansing agents that suffice, their continued use is more potent of harm. This and the importance of employing neutralizing solutions after their use are later discussed.

linseed, or mineral facilitates the removal of dirt and grease. After the oil is applied it is removed with a cloth or tissue towel followed by the use of soap and water. The addition of one of these oils to sand or pumice or still better granulated corn meal (a preferable mixture is later discussed) would be superior to the oil alone provided the mixture (excepting corn meal) contained an excess of oil and a minimum amount of the abrasive agent in order to avoid mechanical irritation.

The excessive use of an abrasive mechanic soap (grit cake, grit paste, or gritty powders), sand, sand soap, and the use of a hand brush are mechanically irritating and are not desirable as cleansing agents. The more frequent or the more vigorously they are employed the more harmful they become. In the aforementioned report of Neal and Emmons[4] they advise that the use of abrasive cleansing agents, sand, and stiff brushes be prohibited.

As is later discussed, soap—an alkaline detergent, is not an ideal one, and an abrasive (mechanic) soap, paste, or powder is less ideal. As a substitute for mechanic soap the following is proposed which is non-alkaline, non-drying, and has a minimum degree of abrasive action. Equal parts of sulphonated neatsfoot oil and mineral oil containing 25% gelatine (Formula 11 page 229) are added to white granulated corn meal in the proportion of one and one-half parts by weight of corn meal and one part by weight of the oil mixture. Yellow granulated corn meal could also be used. To prevent growth of a mold or bacteria ½% chlorbutanol is added.

Granulated corn meal was selected since particle size was adopted for abrasive purposes.* This corn meal oil mixture has the appearance of wet sand. The pH of the mixture is about 5. As a detergent it is used with water in the same manner as is soap. The addition of 1% to 2% sodium hexametaphosphate (pH 6) enhances the preparation when employed to cleanse particularly dirty or greasy hands. Other mineral detergents could be added, but they are alkaline.

This substitute in my observations cleans very soiled hands of workmen as effectively as does an abrasive soap, so that after its use soap is not necessary. It acts not only as an abrasive detergent, but also as an emollient.

Another substitute, although less desirable since it is alkaline, is the following. To cleanse very soiled, especially oily and greasy, hands they are first immersed in a 1% solution or less of sodium metasilicate followed by washing with a mixture of equal parts by weight of flake (chip soap) and granulated corn meal.

For workers exposed to lead the use of sulphur soap would be advisable in order to counteract the action of lead.

In my survey less than 10% of workmen apply an emollient to the hands in winter at the end of the work day. For this purpose equal parts of lanolin and either olive oil, cottonseed oil, or neatsfoot oil, is advised.

* Granulated corn meal is an ideal abrasive, devoid of mechanical irritation and therefore preferable to the commonly employed inorganic abrasives.

Soap as a Detergent

THE custom among workmen is to use that soap to wash their hands that is used for industrial or other purposes (other than toilet) in their place of employment (cases 1a and b, 5a, 6a and b, 7a). Such soap is not desirable as a toilet soap and may be harmful, especially soap powder (scouring powder) which contains large amounts of sodium carbonate.

MECHANIC SOAP. In this study 44 commercially available mechanic soaps were considered. Of this number 17 were abrasive pastes (hand grit paste soap), 15 were gritty powders (hand scouring powder), four were abrasive cake soaps, three were a liquid, two were ointment-like (non-abrasive), and one a soft soap (non-abrasive). The abrasive agent in these soaps is generally inorganic, either pumice, soapstone, silex, or sand. There was at least one exception in which the abrasive agent was corn meal. The hydrogen ion concentration of a 1% aqueous solution of these soaps ranged from 8.2 to 10, with one exception in which the pH was 3. It was therefore not soap in the sense of a saponified vegetable or animal oil. Federal specifications* of a hand grit soap allow free alkali 0.1%; alkaline salts, calculated as sodium carbonate, not to exceed 1%; insoluble siliceous material not less than 25% nor more than 40%. For a hand grit paste soap and hand scouring powder—sodium carbonate not to exceed 2%, free alkali 0.02%, anhydrous soap not less than 8% nor more than 16%, insoluble siliceous material not less than 25% nor more than 50%.

Mechanic soaps may contain silicate of soda in large quantities, as much as 25%, sodium sesquicarbonate, sodium tetraborate (borax), trisodium phosphate, sodium carbonate, glycerol, (to keep paste soft) coloring agents, perfume.

In our observations the most frequently employed soap by workmen whose hands become very soiled is a well known abrasive (grit) cake soap (pH 8.2) or a well known abrasive soap paste (pH 10.0). Most writers advise against the use of abrasive (grit) soaps. Until another equally effective and quick method is offered, and workmen educated to its use, abrasive (grit) soaps will continue to be popular. The aforementioned corn meal mixture is a good substitute for abrasive soaps.

Objections to abrasive soaps are that they may mechanically irritate the skin—this is in relation to their liberal use and the percentage of the abrasive agent they contain—and their alkaline reaction, objections which are later discussed.

Considering the common usage of abrasive soaps their employment in moderation by some persons with normal skin has apparently not been harmful. If they are used, excessive, frequent, and

* Federal specifications for variety of soaps quoted in this paper are those of the United States Bureau of Standards, Department of Commerce, and are supplied (from catalogue) by Superintendent of Documents, Government Printing Office, Washington, D. C. These specifications apply only to soap sold the Government and do not apply to any soap commercially available.

vigorous use should be avoided. A combination of cleansing methods employing abrasive agents should not be used, such as the conjoint use of sand, sawdust, or a hand brush.

If substitutes for abrasive soap herein discussed are not routinely used (which would be ideal) the sulphonated oil—corn meal mixture would then be indicated in circumstances such as in employment requiring excessive washing of hands, persons with a dry skin especially in cold weather, persons who have or have had eczema especially of the hands.

In the instances in my observations in which the employer provided soap for the employees is was not apparent that any discrimination was used in selecting such soap. Most frequently a liquid soap was provided.*1 Liquid soaps are usually very high in coconut oil content. As is later discussed, this is an undesirable feature. If a liquid soap is selected, a liquid castile soap would be the choice, one made wholly from olive oil, or a mixture of olive oil with less than 20% of coconut oil, preferably 10%. Lay persons are not in a position to know what constitutes a good soap and unbiased information is not easily obtained.*2

Toilet Soap. In the literature on prevention of industrial dermatitis some writers advise "a neutral soap," "a soap not too strongly alkaline," "a good toilet soap." What constitutes a good toilet soap is herewith discussed. Federal specifications for a good, commercially made soap for toilet use are: It should be as free as possible from water, lather freely with cold, soft water, be free from rosin, sugar, and other foreign matter, and contain not more than 0.1% free alkali. The specifications allow as much as 15% of the net weight to be water.*3

Coconut oil, the chief oil or fat ingredient in most toilet soaps,*4 is generally regarded as irritating to most skins. This prompts some manufacturers to keep the percentage of coconut oil lower than 20% of the oil used in the manufacture of toilet soap.

Weber's[15] concept of a good toilet soap is one containing not more than 10% coconut oil and in addition slightly hardened oil, palm, castor, and olive oils.

According to Blank[16] the saturated fatty acids of lower molecular weight — caproic, capric, caprylic, contained in coconut oil constitute its irritant agent, since these fatty acids are primary skin irritants. His work also suggests that fatty acids in soap in relation to the hydrogen ion concentration constitute the irritant action of soap. He performed patch tests with fatty acids in conjunction with a buffer solution to duplicate the increase in the pH of the skin—6 to 7.5, which occurs after washing with soap. He observed that at a pH higher than the normal skin the higher molecular weight fatty acids produce irritation, whereas they do not irritate normal skin. Not only does the irritating quality of the fatty acids decrease with increase in the molecular weight, but also the amount of alkali which must be added before a fatty acid becomes an irritant increases with the increase in the molecular weight of the fatty acid. He states that a soap to be non-irritating should contain no fatty acid which will be irritating to the "alkaliniezd" skin, and certainly no fatty acid which is itself an irritant to the skin at a normal pH. Such soap should be made only from palmitic and stearic acids.

According to Mangrané,[17] Lustig,[18] and Schmerda an index of a good toilet soap is its degree of hydrolysis. This depends upon the type of fatty acid and also the alkali. Soaps with slight hydrolysis such as coconut oil and castor oil soaps that are not easily soluble in water exert a greater defatting action, since the skin comes in contact with larger amounts of soap. Potassium soaps (shaving soaps) usually hydrolyze more than sodium soaps. Shaving soaps therefore exert a milder action on the skin than toilet soaps. Hydrolysis is greater with soap made with sodium stearate and sodium palmate. It is less when the molecular weight of saturated acids is low, or the acids unsaturated, or if the fatty acids are of several kinds.

According to Kroper[19] the osmotic phenomenon between soap fluid and the skin is a factor in the irritation of soap. He found that hydrolysis and dialysis of soap (he employed a semi-permeable membrane) were in inverse ratio, the more limited the hydrolysis the greater the dialysis. One of his specifications of a good detergent is that it should have a low dialysis index.

Lewkowitsch[20] states that the best class of toilet soaps contain as a rule 80% of fatty acids. The range in cheap toilet soaps is down to less than 40%. For household purposes all qualities are made, from genuine soap containing 63% fatty acids down through all gradations of carbonated, silicated, "filled," "run" soaps to "scouring" soaps which may contain only 10% of fatty acids.

Neutral Soap. The word "neutral" does not refer to the compound soap which is not neutral in the chemical sense. Soap is the salt of a weak acid (fatty) and a strong alkali (sodium or potassium hydroxide). It is therefore in accordance with chemical laws alkaline. The word neutral refers to the fact that in the manufacture of soap the amounts of alkali and of fatty acids are in exact molecular proportion so that the finished product contains no free alkali or fatty acid.

A "superfatted" soap is one in the manufacture of which olive oil or lanolin is added in order to guard against the presence of free caustic soda in the finished product on the assumption that the caustic soda will combine with them to form neutral soap. Superfatting agents have little influence after hydrolysis of soap, we therefore believe that superfatted soap has been unduly emphasized as a toilet soap.

*1 The fact that liquid soap, in contrast to cake soap, cannot be taken away from the place of employment is an important consideration.

*2 One exception is Consumers Research, a bureau organized on a non-commercial basis to provide unbiased information and counsel on goods bought by the ultimate consumer. Particular reference is made to their volume "Skin Deep," M. C. Phillips, The Vanguard Press, New York, 1934.

*3 The relative economy of soaps is measured by the cost per pound of dry soap.

*4 The nature of hardened oil is not stated. It doubtless refers to the hydrogenation of liquid oils which stiffens (hardens) them. Such hardened oil is usually added to the neutral oil.

All soaps, whether neutral, superfatted, or those containing a minimum amount of free alkali, hydrolyze in aqueous solution and are always alkaline. The alkali of hydrolysis is much greater than the amount of free alkali in the soap. The pH of a 1% aqueous solution (distilled water) of 36 toilet soaps was determined. The range of hydrogen concentration was 9 to 11. Too much emphasis, therefore, need not be placed on neutral soaps or soaps containing a minimum amount of alkali as an index of a good soap.

A number of investigators have shown that hydrogen ion concentration of the skin is increased after the use of soap. This is attributed to absorption of alkali by keratin. The return of an acid skin reaction (about pH 5) usually occurs after several hours. It is this interference with the protective acid mantle of the skin that constitutes, with defatting (drying) action, the chief objections to soap. If soap is used in moderation and exposure is not prolonged, the normal function of the skin is to restore its acid reaction and through secretion of sebrum correct dryness. After continuous or prolonged exposure to soap or to any alkaline reacting substance with special reference to the alkaline salt detergents, the function of the skin to neutralize alkali becomes impaired so that dermatitis may ensue.

As a buffer application after prolonged contact with soap and water, Jones, Murray, and Ivy[21] suggest the use of a 1% solution of sodium hexametaphosphate, a salt of one of the polymers of metaphosphoric acid which has the property of forming a soluble nonionized complex with the alkaline earth metals. In solution this salt has a pH of 6 and can buffer the skin at this acidity against a large amount of alkali. After the use of an alkaline salt detergent, the hands should be rinsed in a buffer or neutralizing solution. In addition to sodium hexametaphosphate a 1% to 3% solution of acetic acid could be employed.

In prevention of industrial dermatitis frequent, excessive, or prolonged exposure to any alkaline reacting substance, soap, or alkaline salt detergents should be avoided. Indeed, this applies to water alone. Such occupations as "beamers" in tanneries, workers in dye houses and in manufacturing felt hats, dish and bottle washers, washerwomen, etc., and in circumstances such as existed in case 1c. In the absence of mechanical devices preventive measures should embrace the use of buffer solutions, buffers incorporated in protective ointments (see Case 8) or the use of acid reacting detergents as herein discussed.

Of the different soaps other than toilet or mechanic soap that workmen may employ for cleansing purposes, soap powder (washing powder) (see Cases 6a and b) is probably the most harmful. Soap powder is a mixture of hard soap and sodium carbonate and frequently contains sodium silicate. Sodium carbonate comprises as much as 50% of the mixture. Federal specifications require not less than 30%. Since it is not incorporated in the soap it is readily soluble. Laundry soap contains up to 15% of sodium carbonate. As later discussed (see Soap and Alkaline Salt Detergents as Primary Skin Irritants) soap is not sufficiently soluble to permit that concentration of sodium carbonate in solution.

Fillers. Such substances that are added to soap in order to produce cheaper soaps, to enhance their detergent action, or to impart to them either some actual or assumed valuable property are called "fillers." The number of substances which are now incorporated with soaps are legion. The majority of "fillers" exert an inert action on the skin and will therefore not be discussed. It is pertinent, however, to discuss such "fillers" as silicates of soda, alkaline salts, and substances that may cause an allergic reaction.

It is difficult to define what really constitutes an adulteration of soap. This has been a matter of controversy in trade and judicial circles, particularly regarding sodium silicate.

Silicates of Soda.[22] This chemical is an important ingredient of soap. In addition to its presence in household and mechanic soaps, some toilet soaps contain 1%-4%. Soaps made from certain fat stocks become rancid on exposure to air. The presence of silicate prevents this. In addition, it is added to soap for the following purposes: To whiten and to harden it, to produce a firm, smooth texture, to increase lather, emulsifying power, and detergency. It is therefore maintained that silicate is a "builder" and not a "filler."

In the manufacture of soap, the 40% commercial solution of sodium silicate is employed. It is not a definite chemical compound, but combinations of different relative amounts of sodium oxide and silica. It was noted by patch tests that the commercial solution is not a primary skin irritant.

Sodium metasilicate *[1]a (more properly sodium metasilicate pentahydrate $Na_2SiO_35H_2O$) and sodium sesquisilicate *[2]b ($3Na_2O.2SiO_2.11H_2O$ or the pentahydrate of trisodium orthosilicate) are definite chemical compounds that have a power for wetting surfaces, emulsifying oils, and are deflocculating agents. They are therefore detergents and are used for a variety of industrial purposes (laundries, bottle and dish washing, metals, machinery, garage floors, etc.) alone or with soap.

A 1% to 2% solution of commercial solution of sodium silicate, or of sodium metasilicate placed in the palms and rinsed with water serves as a detergent.

To determine any possible irritating action on the skin of sodium metasilicate in the strength herein recommended as a cleansing agent, patch tests were performed on the skins of 30 persons. These tests were performed with 2%, 4%, and 6% solutions. All the tests were negative. There was no evidence of any irritating effect. As is later discussed, however, the harmful effect of the alkaline salt detergents concerns their continued use.

Allergenic Action of Soap. The compound soap is not an allergenic substance, that is, the skin does not become sensitized to it. Some of the "fillers"

*1a Sold under the trade name of Metso.
*2b Metso 99, Philadelphia Quartz Co., Philadelphia, Pa.

in soap, notably dyes, perfumes, and essential oils may produce an allergic reaction in those who are allergic to these substances.

SOAP AND ALKALINE SALT DETERGENTS AS PRIMARY SKIN IRRITANTS. Soap as a primary skin irritant may concern the fatty acid as suggested by the work of Blank.[16] On the other hand Lewkowitsch* stated that the quantities of free fatty acid that are liberated after hydrolysis of soap are infinitesimal. Contrary to statements in the literature I do not believe any soap alkalinity per se acts as a skin irritant.

Cake soap comprising laundry, household, or mechanic is not sufficiently soluble to allow the contained alkaline salts (fillers, builders), or indeed any other ingredient, in sufficient concentration in the soap solution to act as a primary skin irritant. Soap as is used for washing hands is employed in solution of 1% or less and not much greater percentage for household purposes.

The aforegoing statement applies to all soap in which the alkaline salts are added to soap after the fats and alkali have been combined. Alkaline salts mixed with the finished soap as in soap powder or mixed with abrasive material constituting gritty powders (hand scouring powder) for mechanic's use may be more likely to act as skin irritants by reason of their ready solubility.

To my knowledge that concentration, if any, of all the alkaline salt detergents used as fillers or builders that acts as a skin irritant has not been determined. We observed by patch tests that the normal skin did not react to 35% solution (saturated at room temperature) of anhydrous sodium carbonate. The role of alkaline salt detergents as skin irritants, apparently, is not inherent to their employed strength, but concerns prolonged exposure of the skin to them whereby they become irritants either because the threshold of irritability of the skin is lowered (toxic hypersensitivity in the sense of Burckhardt) or the skin becomes allergic to them.

In Burckhardt's[23] studies of alkali sensitivity of the skin, its capability to neutralize alkali and the alkali group of eczema, notably that of masons, he concluded that decreased resistance of the skin to alkali (toxic hypersensitivity) is an important etiologic factor in this form of eczema rather than an allergic hypersensitivity. Toxic hypersensitivity concerned impaired function of the skin to neutralize alkali.

Burckhardt's studies suggest that dermatitis from soap in its broadest meaning and from alkaline cleansers other than soap, as herein discussed, concerns a toxic hypersensitivity rather than an allergic hypersensitivity. His study emphasizes the fact that alkaline detergents are not ideal. They should be used sparingly or in minimum concentration. The importance of applying buffer or neutralizing solutions to the skin after their use as discussed in the aforegoing becomes apparent.

SUMMARY. It would appear that the best soap for cleansing the skin is a toilet cake soap. Basic factors constituting the eczematogenous action of soap comprise its defatting action inherent to excessive use, and/or prolonged exposure, and prolonged exposure to alkaline salts not incorporated in soap, but loosely combined as in soap powder. It is not unreasonable that the chief difference in irritating action between toilet soap and laundry soap (in cake or bar form) is the fact that exposure to laundry soap is much more prolonged. Excluding all soap in powder form that contains alkaline salts, the role of soap as an eczematogenous substance has doubtless been exaggerated in view of its universal and frequent use and the dilute solution of soap and its ingredients that is used for toilet purposes.

* "When dissolved in water soap suffers hydrolysis to an extent dependent on the dilution, resulting in the precipitation of acid soaps (eg. sodium hydrogen palmitate) and the liberation of a small amount of free alkali and infinitesimal quantities of free fatty acids." (Lewkowitsch).

Detergents Other Than Soap

THE detergent action of soap is mainly a colloidal phenomenon conditioned by its physical properties, especially its power of lowering the surface tension and emulsifying oils. Other substances having the same physical properties as soap exert detergent action. The following minerals belong in this category and are employed as detergents alone or incorporated in soap. The employment of some of them in soap has been patented. Colloidal clay, Fuller's earth (mixtures chemically allied to clay), soapstone (French chalk, "Kheel"), sodium silico-aluminates (composition containing aluminum, silica, and alkaline earth oxide), silicates of soda, sodium carbonate, bicarbonate, sesquicarbonate, borax, disodium and trisodium phosphates.

There are a number of vegetable meals that are detergents, for example, oatmeal, almond meal (sweet almond), and powdered soap tree bark (quillaja). Oatmeal flour, especially when used with boric acid solution instead of water, is one good method of cleansing the hands of patients with eczema.

There are still other non-soap detergents. Triethanolamine soap and so-called "acid" soap made with naphthenic acids. It is not pertinent to discuss these.

It is pertinent, however, to discuss sulphonated oils and sulphonated esters, ethers, and alcohols.

SULPHONATED OILS. Sulphonated oils have recently been employed as detergents for the human skin. Blank,[24] who has done pioneer work in this field, suggested the following formula as a soap substitute: Sulphonated mixed olive and teaseed oil 25%, light mineral oil 25%, and water 50%. The pH of this mixture is 6 to 7. It is commercially known as "acidolate" (National Oil Products Co., Harrison, N. J.).

The detergent action of sulphonated olive oil, sulphonated castor oil, and sulphonated neatsfoot oil mixed with mineral oil was studied. I believe sulphonated oils mixed with mineral oil should be used with only a minimum amount of water. The following formulas were selected:

10. Sulphonated olive oil*[1]	55%
Light mineral oil	45%
25% aqueous solution gelatine	10%

*1 The sulphonated olive oil employed in this and the other formulas is known commercially as 75%.

The percent of sulphonated olive oil required to obtain a clear mixture with mineral oil varies with different lots. The range is 50 to 60% of sulphonated olive oil and 40 to 50% of mineral oil. In this and the following formula, heat the oil mixtures on a water bath until clear, then add gelatine and stir until solution is effected.

11. Sulphonated neatsfoot oil*2	45%
Light mineral oil	45%
25% aqueous solution of gelatine	10%

*2 The sulphonated neatsfoot oil employed in this and the other formulas is "Acidolene A" (Martin Dennis, Newark, N. J.), and also the preparation of Kali Manufacturing Co., 1410 N. Front St., Philadelphia, Pa. It is clear at room temperature becoming turbid between 50° and 60°F. and solidifies between 45° and 59°F. Turbidity may be prevented by the addition of castor oil or of solvents which prevent the solidification of the fatty acids.

The pH ranges of these mixtures were: No. 10 was 5.35, No. 11 was 4.80. Gelatine was added to all the mixtures as a homogenizing agent. It enhances the preparation from a pharmaceutical standpoint. Formula 11 is prefered, since it is a satisfactory detergent and exerts more of an emollient action. As already discussed, it was selected to add to corn meal as a substitute for abrasive mechanic soap. The odor inherent to neatsfoot oil is considerably less in the sulphonated oil, so that this feature has not been an objection in our experience.

SULPHONATED ESTERS, ETHERS, ALCOHOLS. There is increasing scientific interest in organic compounds which have wetting, penetrating, emulsifying, or detergent properties. These compounds, which may be classified broadly as sulphonated esters, sulphonated ethers, and sulphonated alcohols[25] have extensive use in industry. There is little data available as to their use as detergents for human skin. For this purpose sodium lauryl sulphate and Santomerse S (Monsanto Chemical Co.), a 30% aqueous solution of substituted aromatic sulphonated acids were studied. The addition of one or the other of these compounds to the sulphonated oil mixture did not essentially improve them. Sulphonated organic compounds exert a defatting action on the skin and are in this respect comparable to soap.

The German preparation known as "Praecutan"[26,a,b,c] is sold as a cutaneous detergent. It consists of sodium salts of fatty acid condensation products and sulphuric acid esters of high molecular fatty acids. It is a light brown liquid of oil consistency which foams with water. The pH of the preparation which was studied was five. Bauer[26,c] states that only an insignificant number of his patients had an intolerance to the preparation.

Summary

THE role of cleansing agents applied to the skin in causation of industrial dermatitis is discussed.

The results of studies of methods employed by workmen to cleanse their hands are presented. These studies emphasize the importance of mechanical devices in the prevention of industrial dermatitis and the need of education of workmen and others concerned in preventive measures, especially in the care of the skin and in harmless methods of cleansing it.

Protective medicinal applications to the skin (protective hand creams) in prevention of industrial dermatitis are discussed. Eight formulas of protective medicinal applications, comprising greasy and non-greasy preparations and those that dry leaving a film are given.

Other protective applications (applied before working) are discussed. These essentially utilize (a) hydrous wool fat for protecting from the carcinogenic action of mineral oils and tars, (b) different applications to prevent dermatoses from petroleum and lubricating oils, (c) bland oils to facilitate removal of paint, ink, and dirt and (d) sodium bisulfite ($NaHSO_3$) as a neutralizing and reducing agent.

Harmful and harmless methods of cleansing the skin are discussed. A 10 to 30% solution of sodium bisulphite and a 0.5% solution of sodium metasilicate are stressed as harmless agents for removing such substances as paint, ink, and dye and as general cleansers.

A formula consisting of a mixture of sulfonated neatsfoot oil, liquid petrolatum, and corn meal is given as a substitute for mechanic abrasive soap.

The action of soap on the skin is discussed, including mechanic soap and its ingredients, toilet soap, neutral soap, soaps for household and laundry purposes, soap fillers, silicates of sodium, the allergenic action of soap and soap as a primary cutaneous irritant. Soap is not sufficiently soluble, as employed for toilet or laundry purposes, to permit the alkaline salts it contains, especially sodium carbonate, in sufficient concentration in soap solution to act as cutaneous irritants. Exceptions are soaps in powder form mixed with sodium carbonate.

The role of alkaline salt detergents as skin irritants is not inherent to their employed strength, but concerns prolonged exposure of the skin to them whereby they become irritants either because the threshold of irritability of the skin is lowered (toxic hypersensitivity in the sense of Burckhardt) or the skin becomes allergic to them.

Case Records

ABUSE OF SOAP

1. (a) An employee in the laundry of a hospital, in order to avoid contracting some disease (?), washed his hands each time he handled soiled dry linen. He estimated he washed his hands 25-30 times a day with the soap used in the laundry. He stated that he could work with canvas gloves and could wear protective sleeves.

(b) An employee in a dye house informed me that he, as well as the other employees, washed their hands with the soft soap used in their shop to scour wool.

(c) A woman employed making desk pads experienced a dermatitis of both hands. She glued leather on linoleum. On account of glue adhering to her hands, she immersed them in a basin containing soap and water, which she estimated she did about 100 times daily. She has been doing the same work for three years. Saturated solution of boric acid instead of soap and

water was advised. If this did not suffice, then the use of 2% commercial solution of sodium silicate or 1% solution of sodium hexametaphosphate (Calgon).

Turpentine and Kerosene to Cleanse Hands

2. (a) A woman in a printing shop used turpentine and kerosene for many years in order to remove stains from her hands and forearms. I treated her for dermatitis involving these areas. A "patch test" with turpentine gave a positive reaction.

(b) A drill press operator, handling 85 gears daily, dips his hands in a kerosene cleansing solution after handling each gear to remove cutting oil from his hands. The solution caused the skin of his hands to tingle and burn. After the first week of this work he experienced an acute dermatitis of both hands, which was attributed to the cleansing solution.

(c) A man with a dermatitis of both hands, employed as a gear finisher, dipped his hands in kerosene 50 to 75 times daily to facilitate removal of stain. I attributed the dermatitis to kerosene. He stated that he could work with rubberized cotton gloves.

Paint Solvent to Cleanse Hands

3. (a) A workman spraying lacquer on furniture with a squirt gun presented dermatitis of the hands and forearms. To remove lacquer from his hands and forearms he used paint solvent which he thus employed for four years.

(b) A printer for the past 17 years has used gasoline to remove printer's ink from his hands. In addition, for the past three years he has used a paint remover to cleanse the hands more readily. He was able to wear gloves during the course of his occupation.

(c) A machine operator removes cutting oil from his hands and forearms with a solvent, a gasoline-like preparation which is used in the plant to remove paint and oil from the pipes. For the past three years he has been using this preparation about ten times a day. He presented dermatitis of the hands and forearms which was ascribed to the solvent. Four other employees in his plant use this method of removing oil from their skin.

Gasoline to Cleanse Hands

4. (a) A stripe painter of awnings employed gasoline about 15 times daily for nine years to remove paint from his hands and forearms. The dermatitis of his forearms and hands was attributed to gasoline.

(b) A printer removes lithographer's ink from his hands with gasoline once a day. He has been doing this for eight years. He was compelled to stop work on two occasions because of a dermatitis involving both hands. I attributed the dermatitis to gasoline.

Naphtha to Remove Ink

5. (a) An employee of a rubber company with a dermatitis of both hands informed me that he used naphtha 8 to 10 times a day to remove stencil ink from his hands. At the end of the day he washed his hands with a liquid soap used in their shop to wash rubber tubing. He stated that this soap burned when applied to his skin. He is able to wear gloves at his occupation.

Scouring Powder to Cleanse Hands

6. (a) An employee of a hat factory has been using scouring powder over a period of three years to remove stain from his hands. In his work he immerses his right hand and forearm at frequent intervals in a vat of water for several hours daily. He experienced a dermatitis of his hands and right forearm. I suggested Formula No. 5 to apply to the hand and forearm before immersing them in the tank of water.

(b) A man employed in a carpet factory to clean looms presented an acute dermatitis of the hands and arms. In order to remove grease from these parts, he washed with a scouring powder which was used in his place of employment to scrub floors. The dermatitis appeared after the initial use of this powder.

Hypochlorite of Lime to Remove Dye

7. (a) An employee in a dye house presented dermatitis of the hands and forearms, which was ascribed to cleansing agents. For 25 years he had been handling dyes. He washed his hands about 20 times a day, using an abrasive soap and also the soap used to wash yarn. About three times weekly he used a solution of hypochlorite of lime employed in his work in order to remove stains from his hands.

(b) A dyer presented dermatitis of the hands. He has been handling dyes for 19 years. At the end of each work day he removes dye from his hands with hypochlorite of lime. I ascribed this as the cause of dermatitis.

(c) A woman employed as a machine "seasoner" in a tannery experienced dermatitis of both hands. For many years she has been using hypochlorite of soda to remove stains from her hands caused by the "seasoning."

Pine Tar and Axle Grease

8. (a) In a tannery the men known as "beamers" applied pine tar and axle grease to their hands during work. The latter involved trimming wet, de-limed pelts with a knife on a wooden beam. The skin of the fingers of these men was white, puckered, and considerably macerated. The reason given for the use of pine tar was a protection against lime. It had been thus employed in that shop, according to the oldest employee, for 50 years. Axle grease was used to waterproof the skin. The use of pine tar to dry the fingers, permitting a better grasp of the knife handle, appeared to be a better explanation. The use of Formula 4 was regarded as superior to that of axle grease. It has a pH of 5.4, whereas the pH of the solution which saturates the de-limed pelts was 11. I saw no objection to the use of pine tar.

A Simple Protective Measure and Practice

9. The men spraying paint in a large manufacturing plant applied freely to the skin of the exposed parts before working cold cream supplied by the company. Goggles and respirators were also used. At the end of the work period paint literally covered the exposed skin and was easily removed by means of a clean cloth also supplied by the company. The men stopped work ten minutes before the usual time in order to cleanse their skin.

Recommendations for a Protective Application

10. Employees in a candy factory experienced dermatitis of the arms, which was alleged to be an expression of an allergic reaction to flour. The men involved handled large slabs of sticky candy which they inserted into a machine that cut and packaged it. Flour was sprinkled on the slabs by hand. Considerable flour dust was created when the machines were cleaned. The appearance of the eruption—follicular involvement—suggested a dust born irritant, flour, as the cause. Pending installation of a ventilator, the application of Formula 7 (see page 223 Formula 6 could also be used) to be painted on the arms before working, was one of the recommendations made. Protective applications had to be dry and nongreasy. The formula has now been used for seven months. The incidence of dermatitis following its use has been decreased.

Recommendations for a Protective Application

11. Dermatitis of the hands and forearms appeared among employees engaged in nickel plating electrical utensils. The men immersed a frame holding the utensils into a tank containing a steaming solution of a proprietary compound. The exact composition of this compound was not known but was thought to contain sodium hydroxide, tri-sodium phosphate, sodium carbonate, and sulphonated alcohol. The men worked with sleeves rolled up, their hands and arms were exposed to the steam and

mist from the solution. Dermatitis appeared after variable periods of exposure. Some employees, however, regardless of prolonged contact never had dermatitis. I determined by patch testing normal persons (non-employees) that the solution in question was a primary skin irritant. It was not practical for the men to wear gloves and I was informed that it was not possible (?) to ventilate the tank containing the solution. The following recommendations were made: (1) That consideration be given to employing negroes; (2) That protective sleeves be worn, the type known as leatherettes (Milburn Manufacturing Co., Detroit, Mich.); (3) That candidates for employment who gave a history of ever having eczema or who were blondes would not be appropriate for this work; (4) That such men be employed who gave negative patch tests to the control substances used in patch testing; (5) That protective applications to the skin be employed. Formulas 7 and 9 (see page 223) were suggested. Selection of the one to be used was to be made after a trial of each formula.

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Carbon Disulfide Poisoning

—Report of 21 Cases—

SAMUEL T. GORDY, M.D.,
and
MAX TRUMPER, Ph.D.,
Philadelphia

OF THE many solvents used in industry, carbon disulfide is becoming known as one of the dangerous chemicals. In the pure state it is a colorless liquid which becomes yellow on standing when exposed to light, and is highly volatile at ordinary room temperatures. It is employed extensively in the following processes: In organic synthesis as a solvent for sulfur, iodine, and other reagents; in the elimination of sulfur in ores; in the electrochemical decomposition of silver and as a solvent for fats, oils, rubber, gutta percha and waxes; also for the removal of oil from bones, seeds and oil cake; for extracting volatile oils from flowers, dissolving sulfur and phosphorus for making matches, in varnishes and lacquers and as a preservative. Carbon disulfide is also used for destroying insects such as moths in clothing, plant insects, weevils in grain and for disinfecting soil. It is utilized in manufacturing various compounds such as waterproof cements, in the rubber industry (cold vulcanization of rubber and in gum dipping rubber goods); in the manufacture of transparent paper (cellophane) and enormous quantities are used as a cellulose solvent in the making of artificial silk (viscose rayon).

Of the occupational hazards from the use of

carbon disulfide the greatest incidence of chronic poisoning is to be found in the manufacturing of viscose-rayon, especially in the churn and the spinning departments. In high concentration the fumes are narcotic, causing coma preceded by delirium or acute mania and followed by respiratory failure. However, about 90% of the industrial cases come from chronic exposure in which the manifestations are principally affections of the nervous system. These may vary, ranging from mild fatigue, headache and vertigo to profound visual failure and severe psychic manifestations. In a previous report[1] we presented six cases, in which the principal symptoms and findings were of a psychic nature, three being of the acute and three of the chronic variety. There were but few neurological signs. At this time we are presenting 21 cases, of whom one was frankly psychotic, the others exhibited a rich variety of neurologic disorders. In many of these workers, additional features were disorders of the gastro-intestinal, circulatory, vasomotor and reproductive systems.

In attempting to envisage the clinical picture of this disorder it is helpful to bear in mind that as to mode of onset there are three varieties: acute or fulminating, subacute, and chronic. In the acute cases, if not fatal, the toxic features resemble those in acute narcosis with delirium, maniacal behavior, epileptiform seizures as well as coma of several hours or days duration. Recovery from acute manifestations may be followed by chronic sequellae which may be characterized by psychotic episodes, irritability, attacks of petit mal, frank epileptiform seizures and gastro-intestinal disturturbances. The somatic, neurologic and encephalopathic symptoms are varied and at first not readily classified. After one has seen a number of these cases a neuropathic and encephalopathic pattern manifests itself. We have for this reason summarized the essential findings in our cases to avoid presenting an over-abundance of symptoms.

In our group of 21 cases, the men varied in age from 24 to 67, half of them being from 30 to 50 years of age. The average length of exposure was 10 years. Many of those examined worked in different departments of the viscose plants, but it was not until after they had been in either the spinning or churn department that symptoms manifested themselves. Two of the men had been working in the churn room for only six months when one suffered from marked loss of libido, excessive fatigability and somnolence, the other with headache, vertigo, vomiting and a period of unconsciousness.

The onset of symptoms varied considerably, in many instances being preceded by vague malaise, headache and non-incapacitating gastro-intestinal symptoms of long duration before more serious symptoms set in. Five of the men experienced two or more severe episodes of symptoms with remissions. Case No. 7 had one episode of multiple neuropathy affecting his legs, then a right hemiparesis with dysesthesia of left chest within a period of four months. Case No. 13 during the first year of his employment developed severe respiratory symptoms, which, with a marked loss of weight, was believed to be pulmonary tuberculosis. He improved temporarily and then eight years later developed visual and encephalopathic symptoms. Case No. 17 had first an attack of multiple neuropathy with later appearance of a state of anxiety with lethargy and tremulousness.

Loss of Weight: Nine of the men experienced no loss of weight. Case No. 7 gained 40 pounds over a period of three years after working in the viscose industry. He ascribed his increase in appetite to the fact that he previously used to drink liquor which he discontinued since working in viscose. However it appears that he had really developed bulimia (he had a hypopituitary type of fat distribution). This recalls a case reported by Eichert[2] in which bulimia occurred in a woman following acute intoxication with trichlorethylene. Case No. 9 lost 50 pounds; he had marked gastro-intestinal ulceration with frequent hematemesis. Case No. 34 showed a loss of weight of 70 pounds, with dysphagia resulting from progressive bulbar palsy, and eventually died. The average weight loss in the remainder of our cases was 14 pounds.

Asthenia: Four of the men had no complaint of bodily weakness, in three it was moderate, in eight it was severe, in two it was episodic, while in three it was rather severe and profound.

Gastro-intestinal Symptoms: Six of the men had no symptoms in this category, the rest had one or more of the following: flatulence, which was most frequent of all, pyrosis, anorexia; one had multiple gastric ulceration. The fatal case showed progressive dysphagia.

Respiratory: Five of the men had no respiratory symptoms, seven had dryness of nose and throat, one had two severe attacks of an asthmatic syndrome, two had recurrent epistaxis.

Cardiac Symptoms: Ten of the men showed no cardiac symptoms, six had dyspnea, three had a syndrome resembling angina pectoris, four had tachycardia on slight exertion, one had myocardial degeneration with variable blood pressure.

Libido: In four of the men libido was not impaired, in four there was moderate diminution, in 11 it was entirely lost. In two men libido was present but potentia was diminished or lost.

Vasomotor Symptoms: In 12 of the men there were no vasomotor symptoms. One had "nervous sweats." Three of the men complained of always being cold and especially being sensitive to cold weather. One had hemi-anhydrosis on the left side, one had blanching and blueness of the hands and fingers, and one gets attacks of faintness and weakness of the knees.

Muscle and Joint Pains: Ten of the men had no symptoms of this character; the rest had varying degrees of stiffness and soreness of the limbs; several had agonizing joint pains, two had cramps of the extremities.

Headache: Five of the men were free of this symptom, one suffered from slight headache; three had headache of a bursting character, in nine cases the headache was severe and in different individuals it was associated with vertigo. In one case

there was vomiting as well as headache with vertigo, in another there was a memory defect, and still another had visual disturbances.

MULTIPLE NEUROPATHY: (Polyneuritis). Eight of the men showed no symptoms referable to the peripheral nerves. One man had hypesthesia of hands and forearms and atrophy of the left thenar eminence; one had electric paresthesias of the legs and neuralgic pains in the arms. Two of the men had pains in the arms and legs with numbness and tingling. One had bilateral thoracic pains which were girdle-like in character. Four had numbness in the arms or legs or both, one had cramps in the left arm and lancinating pains of the left chest (cervical and brachial neuropathy), one had paresthesias of the ears and neck (peripheral vagus distribution).

NEUROLOGIC SIGNS: Three of the men showed no neurologic signs. In one man there was a positive Babinski sign on one side and an inconstant Babinski on the other. One man had a left sided positive Babinski and Troemner signs with a left hemiparesis. Three had a positive Romberg, and two other men showed unilateral cerebellar signs. There were six men with muscular tremors, two of intermittent character. Two men had cogwheel spasticity of the limbs, three had speech disturbance, one of which was associated with hemiparesis. Three men had Parkinsonian facies, one with other signs of extrapyramidal tract disorder such as cogwheel spasticity and tremor, and choreoathetoid movements of the right arm. Two others had hemiparkinsonism of the right face. Four had muscular weakness of various extremities, some associated with atrophy of various muscle groups and reflex changes.

SUBJECTIVE EYE SYMPTOMS: Seven of the men showed no eye symptoms. Three had attacks of amblyopia, four complained of spider web sensations before the eyes, three had wavy vision, five were unable to focus properly—this usually occurred in episodes. Three of the men had attacks of burning in the eyes without conjunctivitis, two had diplopia (one with ptosis of the right eye-lid). Three had sensation of colored flashes and whirling discs in the eyes, one had a sensation of shooting stars. In one case the visual disturbances came as a constant precursor to violent headaches.

OBJECTIVE EYE SYMPTOMS: Eleven of the men disclosed no changes in the corneal reflex, the extra-ocular muscles or the eyegrounds. Four of the men showed blurring of the disc margins in one eye and in one case the other disc was affected to a lesser degree. The corneal reflex was absent in one case and two men had unilateral corneal anesthesia.

ENCEPHALOPATHIC FEATURES: In seven of the men vertigo was present. Two men had episodes of vomiting, nine had lethargy or somnolence or both. Five men showed memory defects of varying degree and one had complete amnesia for 19 days. Three had irritability, two had depression, three had insomnia, one had episodes of causeless laughter and weeping, four showed anxiety and two a feeling of inner tremulousness. Case No. 12 had prodromata of headache, insomnia, and irritability, and later developed frank psychosis, marked irritability, quarrelsomeness and became over-religious. He felt that his conduct was governed by God and that he had a mission to perform to lead the world from selfishness to universal kindness. He was in a State Hospital for some time. He had insight to a marked degree. He recovered and remembered much of his psychotic behavior and symptoms.

The routine laboratory tests made on all of the men disclosed no particular trends, no constant variations in the blood picture and no significant urinary changes. The Kahn precipitation test in all cases was negative. In the future, laboratory studies of the lipoid fraction should be helpful, but in our opinion there is nothing pathognomonic. The composite symptomatology, the industrial history and the working conditions will in all likehood remain significant in establishing the diagnosis.

There is an extreme dearth of autopsy material in man wherein chronic exposure is involved, but the case reported by Abe[3] clearly fulfills the pathologic criteria for degenerative as contrasted with inflammatory changes in the central nervous system which has been set up. By the same token the coexistence of encephalopathy and neuropathy in chronic alcoholism with avitaminosis B (Korsakoff's syndrome) has its counterpart in the encephalopathy and other evidences of diffuse central nervous system involvement, together with so-called "polyneuritis" due to carbon disulfide in which autopsy findings were reported in great detail by Abe.[3] More recently in Pennsylvania Bulletin No. 46 Ehrich and Alpers[4] present a comprehensive post mortem report of a viscose worker who died following a gall-bladder operation. They state "the findings in this case conform to the results obtained in a few previous autopsies as well as in experimental animals. The most important changes are acute and chronic injuries of the central nervous system and of the peripheral nerves. In addition there are multiple hemorrhages and fatty changes in the liver, kidneys and heart. Although there is no single post mortem finding which could be looked upon as specific for carbon disulfide poisoning, the total picture seems to be characteristic enough to confirm or discard a given clinical diagnosis."

Comment

KNOWLEDGE of the hazards created by the increasing industrial use of carbon disulfide is in its infancy, especially in the United States. Recently in an editorial in *J.A.M.A.*,[5] it was stated "In the United States a period of 33 years elapsed between the publication of an article on this subject by Jump and Cruice in 1905, and one by Gordy and Trumper in 1938." Since then about 100 cases have been reported in Pennsylvania alone; in which State there are two large viscose plants. There are doubtless large numbers of carbon disulfide poisoning cases not yet reported from the other 18 industrial viscose rayon plants scattered in 12 other states. The cases which we have reported to date are from the states of Dela-

ware, Pennsylvania, Virginia and West Virginia.

Credit is due to Bryn Mawr College[6] for their survey which revealed that there were many cases of psychoses which developed in one viscose plant in Pennsylvania. Their report focused public attention on the hazards of exposure to carbon disulfide and other toxic chemicals widely used in industry.

Dr. Alice Hamilton[7] stated: "A few years ago I had a telegram, sent to me at Harvard, not from a physician but from a registered nurse saying 'Epidemic of insanity in artificial-silk mill. Doctors do not understand. Can you tell us anything?' I wrote back voluminous information. Then I tried to find out what had happened, but it was shrouded in secrecy. I have never heard. There is no sequel to that story at all."

The sequel to this story was given by us in a report on carbon disulfide poisoning:[8] We had examined three of the above mentioned cases in February 1934, and another three in 1935. In referring to that same "epidemic" we stated: "In one antiquated plant which had been changed over into a viscose plant, some 40 women employed in the reeling room developed acute symptoms, with an epidemic of hysteria. The symptoms were excitement bordering on hysteria, yelling, fainting and acute psychoses. It soon became obvious that something was seriously wrong. One of the chemists who analyzed the air of the reeling room used to get sick while collecting his samples of air. The ventilating efficiency of that room was then stepped up 25% above that of any other viscose plant. Nevertheless at intervals there were toxic amounts of carbon disulfide in that reeling room as confirmed by the symptoms of some of the workers. Both the forelady and the foreman in this room were poisoned. What was the trouble here? We discovered that the concentrated carbon disulfide vapors were regularly exhausted from the churn room at a point less than 100 feet from the large and powerful fresh air intake of the reeling room. The exhaust from the churn room was about 30 feet above the ground level and the vapors, being heavy, would tend to drop. It happened that the prevailing winds made certain that some of the carbon disulfide would be carried in front of the reeling room intake." This viscose plant was located in Delaware. Subsequently we found that viscose plants in other states were in need of more effective and up to date equipment. Therefore in June, 1935, we urged the U. S. Public Health Service to make a toxicologic survey of the viscose rayon industry. In the fall of 1936 we had an exhibit at the Pennsylvania State Medical Society at their annual meeting, summarizing the toxicologic and neuro-psychiatric features of carbon disulfide poisoning. Early in 1938 a survey was made of the viscose-rayon industry in Pennsylvania under the auspices of the Federal D.-vision of Labor Standards and the State Department of Labor and Industry. These comprehensive studies were made by a group of medical specialists of the School of Medicine of the University of Pennsylvania, under the direction of Professor F. H. Lewy.[9]

Summary

IN OUR experience with these 21 cases, the composite symptomatology with the individual history are significant in establishing the diagnosis of chronic carbon disulfide poisoning.[10] Essentially we found that 90% showed encephalopathic features varying from lethargy, anxiety states, irritability and vertigo (one of the men was frankly psychotic). Practically 75% showed diminution or loss of libido; 70% had varying degrees of neuropathy affecting the extremities; 67% had subjective eye symptoms. More than two-thirds had gastro-intestinal symptoms, with a high incidence of flatulence and anorexia. More than half the men showed varying grades of asthenia, headache, muscular stiffness, dyspnea and among these a few had an angina pectoris picture; 55% of the men had symptoms which pointed to localized lesions of the central nervous system including Parkinsonism. Finally, 30% had vaso-motor symptoms and a similar percentage showed blurring of the optic discs.

It is encouraging that the scientific knowledge to which all of these recent studies have contributed is resulting in a frank recognition by the industries of the danger involved. The medical profession can aid by giving without hesitation an early diagnosis where the patient is known to have been exposed to carbon disulfide in his work. Such early diagnoses will prevent serious poisonings and will lead inevitably to the installation of modern equipment and devices making for maximum protection of the worker. It will prove a paying as well as a humanitarian investment.

We acknowledge with thanks the kindness of Dr. Alice Hamilton in reading our manuscript and in giving us her valued suggestions.

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Common Types of Heart Disease

Robert S. Berghoff, M.D.,
Clinical Professor of Medicine,
Loyola University,
Chicago

On receiving this invitation, I had to make up my mind as to whether I would talk to you on one particular type of heart disease which might interest industry or whether I should select, possibly rather boldly, three, four, or five. I realized, of course, that if I selected one, I could possibly cover that pretty thoroughly in half an hour, whereas if I selected three, or four, or even five, I might have to skip over them rather hurriedly. Yet I felt that you would be more interested, if time will permit, to hear about three or four, or possibly even five types of heart disease, and that you surgeons interested in industry would perhaps derive the most benefit from the several rather than the one.

But I can't attempt to follow the American Heart Association's classification of heart disease. I have to follow a classification which my associates and I originally devised for ourselves, purely for teaching purposes, which classification makes a rapid discussion of heart disease possible.

We, in our Heart Station, here in Chicago, divide life itself into three epochs of 25 years each; that is, from birth to 25 years for the first epoch, from 25 to 50 for the second epoch, and from 50 to 75 years for the third epoch.

I appreciate that such an arbitrary classification of life is open to criticism. In the first place, some of you will say "An individual's prime runs well beyond his fiftieth year, so how can you place an individual's prime at fifty?" And in the second place, some of you will say, "We want a fourth epoch."

Well, my answer to both, I think, is very logical. You would be willing to admit, possibly, that the average individual—and we are dealing with averages—begins to slow up just a little bit, both physically and mentally, at or around the age of 50. I will grant you that very many valuable men are doing big things in human life at their sixtieth, seventieth and seventy-fifth years, but those men are exceptions. We begin to slow up, so far as our organs are concerned, at least, at about the half-century mark.

And then your other criticism, that you want a fourth epoch of life, can be answered hurriedly, too. Of course you want it, even in times like these, but most of us are not going to get it. Human life has been very materially lengthened, chiefly in that more people have come into their fifth, sixth and seventh decades of life, as you know.

So, dividing human life in that way, if you will allow me, into three epochs of 25 years each. I say to you that each of those epochs has its outstanding clinical type of heart disease, which belongs to that epoch.

Now, I don't mean, for example, that the type of heart disease that belongs to the first epoch, to the people from birth to age 25, is never encountered in people of 25 to 50, or 50 to 75. But I say there is one type of heart disease that occurs so frequently in people under 25 that it belongs right squarely in that epoch, even though it spills over occasionally into the second epoch of life. And so I will talk first on the type of heart disease that we encounter in young people from birth to age 25, subacute or chronic valvular heart disease.

In taking up these types of heart disease, I am going to try to make them applicable to industry. Therefore, I will discuss these types of heart disease as regards etiology, symptomatology, physical signs, diagnosis and prognosis.

Of course, you can't cover three to five types of heart disease in half an hour. What points, therefore, should we bring out about valvular heart disease in young people, a subject which should be of interest to all of you.

In the first place, I am pretty sure you all know, so far as etiology is concerned, that in the last 20 years we have definitely made up our mind that practically all of this type of heart disease is due to one cause and that is rheumatism, in some form or other. We no longer believe that the heart valve in the young individual is ever diseased due to infected teeth or to infected tonsils. It is usually rheumatism that is the bad actor and the condition that injures these youthful hearts.

Now, rheumatism which cripples youthful hearts may occur either as acute rheumatic fever, which is responsible for at least 50% of all these crippled heart valves, or it may occur in many hybrid or atypical forms. But if we include within the broad term of rheumatism, first cousins of rheumatism, such as chorea and even scarlet fever, then I say to you that rheumatism in this broad term is responsible for practically all valvular heart disease in young people.

The symptoms of valvular heart disease we won't go into at all. I am going to skip from the etiology into a brief discussion of the more common types or combinations of valvular heart disease with rheumatism.

The most common form of valvular heart disease due to rheumatism is uncomplicated mitral heart disease (with the mitral valve involved) either as a mitral stenosis or insufficiency or the two together.

The next most frequent involvement of valvular heart disease due to rheumatism is the combination of the mitral and aortic.

And the third and least frequent of all due to rheumatism is the aortic valvular lesion alone.

Now, these few statements have this important bearing so far as industry is concerned, that a prognosis of individuals with acute valvular heart disease due to rheumatism depends, at least in a measure, upon the valve or valves involved. In other words, if you have many young individuals either employed now or whom you anticipate

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taking into your employ, who give a history of rheumatism, you then have the right to know that that disease, if it hasn't already crippled that youthful heart, since rheumatic fever is a recurrent disease, probably will, because it will come back a second or a third time, and there are very few individuals, indeed, who have had acute rheumatic fever, who do not have it recur again and again and finally have it terminate with a crippled heart.

The individual with mitral heart disease alone will give a pretty fair prognosis so far as industry is concerned. Those individuals who have only a mitral stenosis and a well compensated one, as a rule give a prognosis so good that they probably can be used in industry, at least with not too heavy a physical load, whereas I say to you, quite dogmatically again, that the youthful individual who has both a mitral and an aortic valvular lesion, which almost inevitably results in considerable hypertrophy, particularly of the right and left ventricle, — those individuals have a poor prognosis, particularly as regards industry.

Given a youthful individual in your employ, or who is anticipating entering your employ, with a crippled mitral and a crippled aortic, such an individual has a poor outlook, not only as regards his ability to carry the load but also as regards his outlook in years. An individual who before, we will say, his eighteenth year, has both a mitral and aortic involvement—his outlook as regards life is very poor.

So much for rheumatic heart disease.

WE NOW come to the second epoch of life, that of people from 25 to 50 years of age. What type of heart disease do we encounter in these people?

Well, acting on the assumption in the first place that they have been born with normal hearts and that they have no congenital heart disease, and acting on the assumption that they have avoided the rheumatic heart disease, they now come to the most productive years of their lives, and along comes a type of heart disease that strikes them down, and that is syphilitic heart disease.

There are just a few pertinent facts I should like to have you know about syphilitic heart disease.

In the first place, a word or two about its extent. Percentages vary, naturally, in countries and geographically and socially, but I have selected for you very conservative figures, which will still seem to you to be way out of line. But you must accept my statement that from the literature and again from the experience of cardiologists the world over, these figures are conservative and, therefore, important to industry.

At least 4.5% of all male adults who reach the age of 40 or better show definite evidence of cardiac syphilis. That is a big figure. Here is one still more startling. At least 50%, every other individual frankly syphilitic, either through a history of syphilis or through a positive Wassermann, or through evidence of syphilis elsewhere in the body, — every other individual, every other male adult past the age of 40 who is syphilitic, shows at autopsy, clinical evidence of cardiac syphilis. So it is terrifically frequent and a most important type of heart disease that has not been fully appreciated up to this time.

A few things about cardiac syphilis that I would like to have you take away with you are as follows:

First, a word about the pathology. When I went to school 25 years ago, I was told that whenever I thought of syphilitic heart disease or cardiac syphilis, I should think of it in terms of aortic insufficiency. Of course, that is a fallacy. We must have an entirely different conception of the pathology of syphilis today, syphilis that attacks the aorta throughout its length and breadth and that attacks, not the aortic valve, but particularly that median layer and destroys the elastic tissue and muscle fibres of that layer. So, then, if we are to diagnose syphilitic heart disease early—and unless we do diagnose it early, we can accomplish nothing, in a way—we must diagnose it in its earliest clinical manifestation, which is not aortic insufficiency but a diffuse syphilitic aortitis.

Maybe it would be a good idea for me to take just a moment or two to discuss the earliest signs of syphilitic aortitis. What are the earliest complaints of the individual afflicted with cardiac syphilis? His earliest symptoms are few, yet they are sufficient to render a diagnosis possible. They consist of three things, dyspnea, pain, and a cough.

This pain of early syphilis has certain qualifications which give it real diagnostic value. The first is that this pain is a stationary substernal pain which is brought on by inconsequential physical effort or by mental excitation. Now, given a young man, we will say, 28 or 30 years of age, who cannot at his age have a pronounced arteriosclerotic process anywhere, if such an individual complains of a stationary substernal pain with dyspnea and cough, all three brought on by some physical effort that he should be very easily able to do, he is pretty well telling us that maybe he has a syphilitic aorta,—(what are the earliest physical signs which will certify and verify our suspicions that a given individual's symptoms are due to an early syphilitic heart?).

Again, those physical signs are few, but they are sufficient, and they consist of a widening of this youthful aorta from the accepted norm of, we will say, 3½ to 3¾ centimeters to well beyond 5 centimeters, as determined by percussion and verified by either of the two methods, flat plate or telerent goenography.

Next, over that wide aorta, quite early you will hear a systolic murmur, not due to a stenosis of the aortic valve but due to the swish of the blood back and forth through a widened aorta.

There we have the earliest clinical picture of syphilitic heart disease, which you and I must detect if we are to do anything for these youthful people with their diseased hearts. If we wait for one of the complications of syphilitic heart disease to appear, not only will the disease have

progressed greatly but our treatment will be both ineffectual and hazardous. The complications which arise and which then predicate dire consequences are, as you know, aneurysms, aortic insufficiency and the symptoms and signs of coronary insufficiency due to syphilis.

So just let me say this about the early heart invasion of syphilis. As men interested in detecting heart disease early in industry, you must get a new slant on syphilitic heart disease and not wait until you have a frank evidence of aortic insufficiency to diagnose syphilis. You must base it on the history, on those symptoms of stationary substernal pain, dyspnea and cough. There will be no material enlargement of the heart at all, because the left ventricle, which gets so large in cardiac syphilis, does not enlarge or hypertrophy until the aortic valve becomes insufficient, as you and I know, and that is a later stage of syphilis.

How about the prognosis of syphilitic heart disease? I need hardly mention the fact that it is poor; the prognosis is no good, and it is no good chiefly because we don't diagnose syphilis in its early stages. Once we have signs of aortic insufficiency or aneurysm or coronary insufficiency due to syphilis, we can no longer do much about it, and therefore the prognosis is not good.

The treatment of syphilitic heart disease, I am not touching on at all. I suppose I should feel rather guilty, standing before a few hundred eminent men like yourselves and talking in this elementary fashion. But you will pardon me because, as I said at the outset, rather than select one type of heart disease, I will ramble along on three or four, or possibly even five, with the hope that I may possibly leave an occasional thought with you that you haven't had for a while on this subject.

WE COME, then, to the third epoch of life, that of people from 50 to 75 years of age. What types of heart disease do we encounter in them?

Well, we will encounter one of two different types, or the two co-existing even more frequently than standing alone, the one having to do with the heart muscle and the other having to do with the nutrient vessels, the coronary arteries.

Now, what should we know, so far as industry is concerned, about the individual with a chronic heart muscle disease? You know, the nomenclature for that chronic heart muscle disease is unsatisfactory. For years, the textbooks have called it, and we have called it, Chronic myocarditis. Now, chronic myocarditis is a poor term, because there is no "itis" at all in those old hearts; they are not diseased; they are just wearing out.

Then we changed to chronic myocardosis. Then Christian some 10 years ago thought that chronic non-valvular heart disease might be a better term for these older hearts.

My associates and I like to think of this type of heart disease that occurs in people who grow old, 50, 60, 70 and 80, as "Chronic Myocardial Insufficiency." We appreciate that there is no disease of that heart at all; that it is simply growing weary and old, functionally old, and so we call it chronic myocardial insufficiency.

Now, irrespective of whether you want to think of that chronic heart muscle in older people as a chronic myocarditis or chronic myocardosis, or our term, chronic myocardial insufficiency, what are the earliest symptoms which an elderly individual, irrespective of his age, as a rule and most frequently gives to show that his heart muscle is getting into trouble?

The earliest of all and that most frequently encountered is dyspnea, shortness of breath. More old people, whether they be 50 or 90, will complain of shortness of breath on inconsequential physical effort than any other one symptom.

Linked with that, the second is a substernal pain, as in a syphilitic, because their chalky, dilated, widened aorta no longer stretches as easily as it did, so they complain of dyspnea, pain nad cough.

And then, as you know, as the heart muscle situation grows worse, we get some of these general symptoms that we have never correctly laid to the heart directly. I am wondering whether, for instance, the amnesia, the forgetfulness, the vertigo and all those mental symptoms that occur in older people, whether in part, at least, they are not due to the fact that there is an insufficient amount of blood brought to the cerebral areas through already arterio-sclerotic cerebral vessels. At any rate, there is a subjective picture of the heart muscle of an older individual.

What is the prognosis of heart muscle insufficiency or chronic myocarditis? Oh, it is swell, if you will pardon such an expression. It is just fine. We feel that we are doing more for people with a heart muscle that is growing old, irrespective of whether they are 50 or 80, than we are for any other type of heart disease. Their heart is not diseased; it just needs help.

Let us make this applicable to industry. We will take a man 55 or 60 years of age. He is not old, yet he may have symptoms of heart muscle insufficiency, of dyspnea, cough and pain. Now, if we will relieve him, in the first place, for a while, relieve his physical and mental load, and if we can at the same time support actively his heart muscle, which needs support, through the old sheet anchor, digitalis, it is just amazing how that picture changes. He becomes an optimist; he wants to live; his symptoms of dyspnea and cough and pain disappear, or at least are improved. And I want to leave that definite thought with you, that because an individual at the age of 50 or 60 or even 70 complains of symptoms of heart muscle fatigue, if he is a valuable man in industry, he by no means has to be shelved. He can be helped. If he can be given a lighter load for a while, more rest at night and, if possible, an hour or two of rest lying down during the day, and then supported through the proper maintenance dose of digitalis, you will have a different man in industry and have a very valuable man again.

How about the very important and interesting subject of coronary disease as it affects industry? Well, in the first place, this may sound terribly elementary to you men who know as much about heart disease as I do, but that we must definitely

differentiate the two important types of coronary disease goes without saying, because they are different in their etiology, they are different in their mechanism, they are different in their prognosis and their management. There is no excuse whatever for any of us, except in exceptional instances, to be confused between the two types.

On the one hand, we have, we will say, the so-called angina of effort, or the individual with coronary insufficiency short of a block, short of an occlusion. That is one type. On the other hand, we have the individual with acute coronary block or acute coronary thrombosis.

Of course, the pictures are entirely different. So far as the symptoms are concerned, there should not be any confusion, and there dare not be, because if there is, the results are likely to be disastrous.

A word or two first about the individual with coronary insufficiency short of block, or the old term, angina of effort, if you will. You know that classical picture so well, the individual who, after physical effort and mental excitation, has a sudden episode of pain, severe pain, radiating up into his neck and jaws, or down his arm, either the left arm or the right arm, or the two together, or, in the absence of pain, the sense of strangulation, the entire episode lasting but a few moments and relieved either with nitroglycerin or a coronary dilator, or, in the absence of medical help, relieved with nothing at all. That is the situation of angina pectoris, a very common thing, so well understood that some people carry their own nitroglycerin with them for the purpose of relieving their attacks.

But the other story is vastly different, that of the individual with acute coronary thrombosis. That individual may have his episode come on following effort or after mental excitation, but, as you and I know, it occurs just as frequently while he is sitting peacefully in a chair after his dinner at night at home. It occurs almost as frequently while he is in bed at night during his sleep. It needs no exciting factor whatever.

Therefore, the differential diagnosis between the two hinges upon this one very important statement. The individual with angina of effort hasn't been injured at all. He has suffered no injury, and it is over in a few moments and, when it is over, he is just as well, except for the fear engendered in him after the first attack, as he was before. He hasn't been mortally wounded; nothing has happened to his heart muscle at all; and therefore, when we look at him, we can tell that. I mean, his heart tones are perfectly normal, usually; his rate and rhythm are normal; his color is good and he feels well.

However, the individual with acute coronary block very quickly, as you and I know, develops a myocardial infarction, an area of diseased heart muscle, and therefore he is immediately and always in shock—in shock that is just as characteristic and just as deep as we occasionally see in the operating room in surgical shock. He is sweating; he is cold; he is clammy; his pulse is terrible; it is irregular; it is fast and of poor volume. His heart tones represent the same picture, a very bad picture to look at. We think, and he thinks, he is going to die. He has had an acute coronary thrombosis; he is mortally wounded.

And then, if you want more in a differential diagnostic way between the two individuals, the next day the individual who has had his attack of angina of effort is perfectly well. He runs no temperature; the laboratory shows us no leucocyte count, and the electrocardiograph very frequently reveals very little.

On the other hand, we get a great deal of information on the other individual, the one with acute coronary block. He runs a temperature, because he has an infected heart muscle, and he has an associated pericarditis. He has a leucocyte count for the same reason. His electrocardiogram almost always shows concrete evidence of infarcted heart muscle.

Why should we be so positive, so sure, in our differential diagnosis between the two?

IN industry, it is particularly important that we differentiate the two situations all the time and as early as possible, because the individual who has sustained an attack of angina of effort is very valuable to industry. He hasn't been very much hurt. If his habits are altered and if he is given the one particular drug that we like so much as a coronary dilator over a long period of time—and I am referring to aminophyllin—that individual may and usually does become again a very important cog in the wheel of industry. He can carry and should be provided a lighter load; he should have a little more rest, but gradually he can work back into almost any situation except that which calls for real heavy physical effort.

Now, as to the individual with acute coronary block, what is his outlook? Well, I think I am giving you a more cheerful message on this than I would have thought possible as short a time as five years ago. You know that we used to consider acute coronary thrombosis as one of the most dangerous things in medicine, associated with a terrifically high mortality. You and I can remember when it was quoted at 33⅓%. Not so long ago, every third individual afflicted with acute coronary block was supposed to die almost immediately; the next third were supposed to live for a period of three to five years; and the other third for a little longer.

That picture, under earlier diagnosis, under more careful management, has changed entirely. I would hesitate very much, looking them all over, to quote you from personal experience along that line a figure on the prognosis of acute coronary thrombosis. But you can put it down as under 10%, which I think is absolutely marvelous, largely due to the fact that we have diagnosed these situations earlier, but, more important than that, because we have come to realize that it takes, not weeks, but some months to repair that area of heart muscle. We no longer put these people to bed for six weeks and then, rather ridiculously and dogmatically, say: "His six weeks are up, so let's get him up." It varies with individuals as

to how long they must be kept at absolute physical rest and mental ease. I know that two months is a very moderate under limit, and three and four months is not too long, and five months is not too long for an upper limit. It will vary depending upon the size of the myocardial infarction, as determined in two or three different ways, and it will depend almost entirely on that individual's heart muscle reserve as indicated when we get him back to exercise.

If we have had an individual with acute coronary thrombosis at rest for eight weeks and he gets out of bed and has heart symptoms and signs again that make us believe his healing has not been completed, back he goes to bed for a month. And I say to you that if you take away that one thought that you are going to overdo the matter of physical rest by a month or six weeks, as opposed to what you have done in the past, you will be amazed at the results in your coronary individuals. I have talked rapidly for a half hour. I know it has been unscientific, but I have tried to cover a few things and I hope you have liked it.

Discussion:

DR. McGAUGHEY: I would like to hear what DR. BERGHOFF has to say of the pain that follows coronary occlusion after the apparent recovery of the heart muscles.

DR. BERGHOFF: I think that was a very unkind thing for DR. McGAUGHEY to ask me because he did it privately and I told him I had a very set opinion on it and couldn't prove it; that there wasn't anything in the literature on it and I was afraid to put anything in the literature on it because I couldn't prove it.

More and more we are seeing people who have gone through an acute coronary occlusion and who shortly after their episode developed a soreness or pain in either one shoulder or both, most frequently the left shoulder, although not too infrequently the right. It lasts from weeks to months and up to three years ago, I, like the rest of the profession, had considered this as simply an unasssociated neuritis or myositis. However, lately, and maybe I could report on, we will say, conservatively, a dozen individuals who, after acute coronary thrombosis, developed just this sort of soreness and pain and relieved, if you will, interestingly, by nitroglycerin.

So definitely and so frequently does this situation occur following an acute occlusion in people who have never had anything like it before that, to my mind, there is a very definite hook-up. Now, until I can have some rational explanation as to the mechanics of this situation, I certainly am not sticking my chin out to try to explain it.

I will say this, that just two months ago, somebody fairly close to DR. McGAUGHEY, whom he knows very well, had just this situation, the coronary thing followed by pain, and this patient was in the hospital. From that room where this patient was, my resident, my intern, DR. McGAUGHEY's son, and my associate and I traveled to another room where we had a man three months past the acute occlusion and we asked him how he felt. He said: "The only thing that bothers me is this severe aching pain in my left shoulder, which I have had for almost four months." What it means, I don't know. That there is a hook-up, I am thoroughly convinced.

DR. FROST: I would like to ask DR. BERGHOFF whether he believes it advisable to let an engineer return to his regular position after he has had a severe coronary attack. I had that brought to my attention a short time ago. I wrote DR. MYERS and asked what he would do in a case of that kind and he told me that they considered letting these men go to work in yard service. I wrote to DR. JOHN R. NILSSON, Chief Surgeon of the Union Pacific, and he said: "Under no circumstances." I wrote to DR. DOWDALL and he told me that they permitted them to return to yard service.

Now, after I had had these various experiences, I decided that I would let this man run an engine in yard service, only to find out that he was totally color blind. And he had only been running an engine for 30 years! Well, the way I handled that situation was, the grievance man came up with this employee to my office, and we both pronounced him totalled color blind, both to the test and also to the stains. The local immediately appointed a committee and they took his color vision and they found out that he was not color blind. I went down to Evansville, Indiana, and called this same committee together and had them take his color vision while I was out of the room, and they decided he was totally color blind.

I showed them how easily that could be done, and how these men can pass these color vision tests without seeing the colors, which is merely guessing. But under the circumstances, of course, I couldn't let the engineer run this engine. But it has been quite a problem to me, to know when to permit these men to return to work. I sent a case not more than two weeks ago to DR. PIERCE with the same decision to make. I know that this man had had three distinct coronary attacks in which his color was very, very bad, and in which he experienced profound shock, was bathed in perspiration, and had all the classical symptoms. But then these attacks clear up, and it has always been a problem to me when and what to do with those men regarding their regular work.

DR. BERGHOFF: I am sorry, too, that DR. FROST saw fit to ask that one. Last month, at Collinsville, Illinois, for some strange reason, in talking on coronary disease, a man said: "Would you allow an individual to, for example, run an engine on a railroad after he had had a coronary occlusion?"

I said: "That is a tough one, because I am going to talk to a lot of New York Central surgeons pretty soon and they may ask me that, and it is a difficult question."

I feel like this about it, though. In the first place, it is absolutely essential, is it not, to differentiate between a coronary situation short of a block? I can't myself conceive that the episodes that DR. FROST speaks of represented three distinct attacks of block. Even though this individual had shock and a few other things, ordinarily speaking, of occlusion, they don't occur at such frequent intervals. I rather believe that an individual who has had coronary seizure short of a block, on our favorite aminophyllin drug and a sufficient period of rest, should be able to resume occupations, even including one of that type — and I am assuming it is a stationary engine —

DR. FROST: No, a locomotive.

DR. BERGHOFF: Well, there it becomes almost an individual problem. I would say as to a man who had a coronary seizure, with pain, etc., which then remedied itself with proper management and which left him symptomless under ordinary occupations, that he could fairly safely be put back on that sort of job again, his heart muscle and his coronary flow apparently being fairly normal according to all the standards that we have.

When we come, however, to the opposite story, one of a true coronary block, where we know the individual has had a myocardial infarction, then you are up against a very serious hazard. I don't know.

DR. FROST: This man was in the Veterans' Hospital for five weeks, and that was their diagnosis.

DR. BERGHOFF: I would like to know in what period of time he had three seizures.

DR. FROST: About a year and one-half.

DR. BERGHOFF: I don't think he had three attacks of coronary block in a year and one-half. If he did, he was running a record for himself. One surely was, but maybe the other two were not. Any man who had three attacks as serious as that in as short a period of time as a year and one-half, whether they were blocks or simply severe anginal seizures, is certainly not good material for an engineer. He will have one some day while he is at his post and needs to have his wits about him. But whether he had a block or not, if he had three seizures in a year and one-half, he shouldn't be riding an engine.

MEMBER: Not long ago I happened to be sitting at the bedside of a patient at the time he had one of these coronary attacks and the only thing that was available was some chloroform. So I used that, not surgically but clinically, and the result of the use of chloroform clinically was so good that I kept on for three or four days, making a cardiographic study since then, and it didn't show any damage to the heart. The circumstances enforced the use of the chloroform at the time.

DR. BERGHOFF: The question now asked is about the treatment of acute coronary occlusion. That is a big contract. My comment, in brief, is this, that whereas the treatment or management of angina of effort is, as we all know, a matter of relief from physical and mental overburden and overwork, plus the conorary dilators, the management of acute coronary thrombosis has resolved itself around the management of an acute emergency. It has to be treated symptomatically and you cannot treat every coronary acute block the same way. An acute coronary occlusion has to be treated symptomatically in this respect. Given an individual who has had an acute coronary occlusion, who has no dyspnea, we will say, at all, we will gain nothing and, in fact, might lose, by putting that patient in an oxygen tent, for example. Another individual who needs oxygen may need that oxygen so badly that it is the most important thing you can do for him. They all, irrespective of how big the infarction that occurred, need physical rest quickly and sufficiently; and that "sufficiently," as I told you before, varies very widely. Now, if chloroform by inhalation leads to physical and mental quiet and rest, it is all right. As a routine procedure, personally I don't favor it. How much morphine or opium in any form to use again depends upon the individual. We in our experience use it very freely. We like it for the first 48 to 72 hours to keep those people very quiet, physically and mentally. We feed them in small quantities, even occasionally by the rectum, nothing by mouth at all.

I would like to make a point of one little issue here. There are probably three times during a coronary episode when the individual is more apt to die, to have a quick exodus, than at any other time. The first, of course, is as soon as he sustains his block. He might die right then naturally, not dying as a result of the infarction but dying an embolic death.

The next period would be for the first five days following his occlusion. We keep them extremely quiet.

And then finally, there is a period just around the three-week time, from the nineteenth to the twenty-first day, where many of these fatalities occur. So that, knowing that situation, we keep them extremely quiet from the first to the fifth day, we let them have a little more physical and mental liberty for a week or 10 days and then, as we approach the third week period, we again quiet them down.

By far the most important thing in the management of acute occlusion is sufficient time of absolute physical rest and then the transition period from that into a mild form of exercise. If you will believe me that you are doing yourselves, and your conscience, a favor, if you will never allow an individual with acute occlusion to be ambulatory at one or two months, I will be very happy.

MEMBER: I would like to ask whether you think digitalis has any place in the treatment of coronary occlusion. I know there is some difference of opinion upon that score. I would like to have your suggestions.

DR. BERGHOFF: In a coronary thrombosis?

MEMBER: Well, not necessarily acute.

DR. BERGHOFF: Of course, the subject of digitalis therapy in coronary disease is, again, a voluminous one. In the first place, as you know, there are two schools of thought in the matter of digitalis therapy. There are some excellent cardiologists who believe it plays no part and shouldn't be used except in acute decompensation.

We don't feel that way. As I told you to start with, we believe we accomplish more for old hearts with no disease at all, through a small sustained dose of digitalis than anything else. When it comes to coronary disease, then we are careful; we are unusually cautious. For example, in people who have had an acute coronary occlusion, even during the course of that, with auricular fibrillation, or with the many arrhythmias and interferences with rate that we encounter during the course of an occlusion, we use digitalis extremely cautiously.

I go on this assumption, that if a man has an acute coronary occlusion and, because of that, a myocardial infarction and, because of that myocardial infarction, a very terrible type of heart situation, for which he needs digitalis, we probably won't give him much result with the digitalis anyway unless we push it pretty heroically, and we don't do it. I use digitalis almost as cautiously during the course of an acute occlusion as I would think of using mercury or arsenic in cardiac syphilis. Once the complications have arisen, I would be afraid of it. However, when we go to the conorary type short of an occlusion, the so-called anginas of effort, I use it constantly in small doses, in conjunction with aminophyllin, the two together, and, I think, with excellent results.

I will just point this out and then I will stop. If you have an individual who has quite frequent attacks of substernal, radiating pain and shortness of breath, which you yourselves have made up your minds are due to coronary insufficiency, those individuals put on and kept on a small dose of digitalis daily, plus a small dose of aminophyllin daily, will not only feel better but will have less frequent attacks of pain, and I think you can do it with safety. When it comes to occlusions it is dangerous.

DR. THISSELL: Is there any way of keeping our coronary arteries flexible so that won't happen.

DR. BERGHOFF: No. I wish there were. We all wish there were. I don't know of any. Do you? It is just part of the process of growing old. Some of us don't get that until we are in our nineties, and some get it as early as 40 or 42. From statistical studies, not on my own experience, but from national statistical studies, I am convinced that coronary disease is not occurring much earlier now that it was 30 years ago, contrary to what the newspapers would have us believe. The fifth and sixth decades of life are still the decades for coronary disease and not the fourth.

The Industrial Nurse

—as a Teacher of Nutrition—

MISS LEONE PAZOUREK,
Nutritionist,
Illinois State Department of Public Health,
Springfield, Illinois

WE KNOW that the progressive employer is as interested in the health and working ability of his employees as the progressive teacher is in the health and scholastic ability of her children. Repeatedly science has shown us through well conducted experiments the association of poor health, inefficiency, emotional depression, dulling of the intellect and loss of initiative with nutritional deficiency. Some of these studies date back to the time of Oliver Wendell Homes (1841), and he even wrote a humorous poem in honor of them:

> "No life worth naming ever comes to good,
> If always nourished on the self same food,
> The creeping mite may live so if he please,
> And feed on Stilton till he turns to cheese,
> But cool Magendie proves beyond a doubt,
> If mammals try it, that their eyes drop out."
> (Xerophthalmia referred to)

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Too frequently it is believed that this nutritive deficiency chiefly results because of the inability of the average family to secure sufficient food. This is not true in America. It is true that in some instances poverty may be so acute that sufficient food is not available, but in this country most cases of nutritional deficiency are the result of other factors. Among these may be listed ignorance in the choice of food, perversity of appetite, faddism, increased requirements associated with illness, inadequate absorption and utilization.

The most important of these is ignorance. Too frequently is the food dollar spent in such a way as to give the family very little in return in nutritive value. To receive as great a return in nutritive value from the food dollar as from the dollar spent otherwise, one must exercise intelligent selection, even painstaking care, in the purchase of food. To do this one must know the great value of milk, the excellence of its proteins, the need for the calcium it supplies, and the wonderful bargain it offers in food values. In addition, one must know too the value of fruits and vegetables, especially the green leafy ones; and that foods attractive in the market and pleasing in appearance on the table do not always give good return for the money expended in purchasing them.

Less easily disposed of is the nutritional deficiency which comes from faddism, and perversion of taste. This applies not only to children but also to adults who have accustomed themselves to one-sided diets. This cause of nutritional deficiency is often most difficult to correct, which may be aptly illustrated by the quotation:

> "I eat my peas with honey
> Which I know isn't nice,
> But you see — the honey
> Makes the peas stick to my knife."

This limited food selection deprives the body of nutritive essentials necessary for good health and vitality. In the correction or elimination of these problems, the industrial nurse has a splendid opportunity to give excellent service to her employer, his employees and their families. To do this, she must have a knowledge of the fundamental nutrition principles and how to apply them. It may be that it has been some time since she has completed her nurse's training and needs to refresh her memory regarding her nutrition knowledge. Too, since the science of nutrition has had and is still having its greatest growth period, many of those nutrition fundamentals she acquired while in training have been changed and improved. An ideal way, of course, to bring herself up-to-date in these fundamentals would be to take a course in nutrition in a college or university having such a recognized course. This, though, is difficult for many to do. However, there are excellent opportunities for her to acquire much practical nutrition knowledge from authoritative books and from magazines and pamphlets distributed by various health and welfare agencies employing qualified nutritionists. Standard textbooks on nutrition are revised frequently and include latest material up to time of publication. A frequent review of some of these books is always beneficial.[1] In addition, much material, free or low cost, may be procured by being placed on the mailing list of the agencies employing nutritionists. Every industrial nurse interested in the health and welfare of the employees will avail herself of this opportunity to keep up-to-date in nutrition.

Having her nutrition information well in hand, she may assist the employees further to secure more food value in return for their food dollar. To do this she should assist them in planning their food budgets.

FEEDING the family is one of the most vital problems in family welfare. Since every man, woman, and child should be provided with food sufficient in quantity and containing the essentials for vigorous health, every organization should consider attention to the nutrition of the individual as an essential part of their constructive program.

Proper food selection will influence life at all ages, particularly in:

1. Improving growth and development of children and providing more vitality and endurance for both adults and children.
2. Decreasing the incidence of dental caries and dental infections.
3. Increasing resistance of the tissues to many common microörganisms which weaken their structure and pave the way to disease.
4. Eliminating deficiency diseases such as pellagra, scurvy and rickets.
5. Promoting better general health — thus promoting stability and efficiency and relieving tension and irritations.

That advice on food selection may be needed regardless of the amount of money available to spend for food was brought out by a nation-wide study, made by several federal bureaus,[2] of the food purchasing habits of 28 to 30 thousand families of wage earners and low-salaried office workers having a steady income. The expenditure ranged from one dollar to six dollars per person per week. More than half of the self-supporting families in small cities spent less than three dollars per person per week. Because the food expenditures are usually more flexible than any other budget items, the food bills offer the best opportunities for economies. In others words, rent, fuel, and light, and in many instances car payments, gasoline, movies, etc., are taken care of first. What remains of the weekly or monthly pay check after that will have to meet food needs as best as possible.

All over the country families spending the same amount per person for food obtained varying degrees of adequacy, depending upon their knowledge of food selection. In the North Atlantic

1. Some source books of information on basic principles of nutrition are: "Newer Knowledge of Nutrition"—McCOLLUM; "Foundations of Nutrition" —M. S. ROSE; "Food and Health"—H. C. SHERMAN; "Feeding the Family" —M. S. ROSE.

2. Government agencies assisting in making the study were the Bureau of Home Economics, Department of Agriculture; Bureau of Labor Statistics, Department of Labor National Resources Committee, Central Statistical Board; and Works Progress Administration.

states where food costs do not differ greatly, out of every 100 individuals spending approximately $1.60 weekly per person for food, two persons had a rating of Grade A (a diet adequate in all essentials with a margin of safety); 37 had Grade B (a protective died of minimum requirements); while 61 had a Grade C rating (a diet lacking minimum requirements). Knowledge of food value was the deciding factor in obtaining the higher grade diets. Instead of two, all of the 100 persons could have had protection against deficiency and malnutrition if they had understood or wanted to buy foods giving the best value for the money spent.

Families spending as much as $4.00 per person per week had a much easier time in getting a better selection of food, but even among this group there was quite a difference in the quality of the diets. Out of every 100 persons, 77 had a Grade A diet, while 19 had Grade B, and 4 had Grade C. Even with more money to spend, one-fourth of this group failed to make a Grade A rating because of lack of knowledge or of interest in adequate diets.

Many families buy too much meat and rarely purchase such nutritious foods as dried peas, beans, and lentils. Others buy expensive canned spaghetti and macaroni instead of using more potatoes. The vitamins most frequently lacking are D, B, A and C, their frequency of deficiency being in the order named. Sunshine is the cheapest source of vitamin D — being supplemented in winter by irradiated milk and cod liver oil.

Vitamin B deficiency has been increased by the use of refined flours and cereals and increased amounts of sugar in the modern diet which tend to crowd out other foods.

The best low cost sources of vitamin A are the green leafy and yellow vegetable, liver, eggs, butter and milk.

Vitamin C may be secured cheaply from raw cabbage, raw and canned tomatoes, oranges and potatoes.

Molasses is superior in minerals to other syrups in the market—hence its emphasis by all nutritionists.

Prunes are among the cheapest of the dried fruits and among the best for minerals.

Potatoes, because of their regular and frequent use, are excellent sources of iron, too.

A deficiency in phosphorus and calcium is also frequently found. A chart may be used to show relative amounts of these to be secured from common servings of food.

In order to help people understand how these essentials may be procured and increased, extensive use should be made of charts, posters and other graphic illustrative material.

The following suggestions should be observed in making charts:

1. Make charts as instructive, simple and attractive as possible.

2. Use only up-to-date material as basis of information (Home Economics Bureau or other equally reliable).

3. Portions should represent an average serving.

4. Use only foods procurable in your community.

How many of the families of the employees you come in contact with are spending their food dollar wisely? What are you doing, through this splendid daily contact with people who have confidence in you, to help them by means of simple nutrition instruction and guidance to secure better health, more vitality, resistance to disease and — therefore — better working ability and happiness?

In any plan to help the family to secure an adequate diet, the whole budget must be considered. Appropriate division of the weekly or monthly income must be made for rent, food, clothing, fuel and light, household operation, health protection, insurance, church, and recreation. Sometimes the budget supports the family's contention that it is unable to meet even the basic necessitates for adequate food. On the other hand, the budget may show that better planning will enable the family to secure a better food allowance and maybe even start a bank account.

Intelligent advice about food expenditures requires a detailed knowledge of quantities of each type of food, (milk and eggs, vegetables and fruits, grain products, meat and fish, fats and sweets). No food budget, either minimum or liberal, may be considered safe without such knowledge. If the following foods are used in the food budget, optimum food value at low cost may be obtained:

Milk

1 quart daily for each child.

1 pint daily for adults.

Select pasteurized, unsweetened evaporated, or powdered milk to get most food value for money spent.

Vegetables

Potatoes and one or more other vegetables daily.

Some raw vegetable three or four times a week.

Vegetables should average not over five cents a pound for low cost diets. Canned vegetables may be used when fresh vegetables are too expensive or not available.

Fruit

Citrus fruit or tomatoes (which may be used in place of fruit) daily for young children.

Fresh fruit or tomatoes daily for other members of the family — with preference given to citrus fruits at least three or four times a week.

Other fresh or dried fruit daily when possible.

Bread, Cereals

Bread or cereal, one or both, at every meal, at least half whole-grain.

Whole-grain cereals, such as oatmeal, dark farina, Ralstons, cracked wheat; and dark breads such as whole-wheat and rye, provide most food value at least cost.

Home cooked cereals are cheaper than those that are ready to eat when purchased.

Eggs, Cheese, Dried Legumes

3 or 4 eggs weekly for each child and adult.

Cheese or legumes (dried beans and peas) two or three times a week.

Meat and Fish

Once daily (for economy 3 or 4 times a week).

Cheese, legumes, or eggs on days when meat and fish are omitted.

Cheaper cuts of meat (palatably prepared) are just as nutritious as the expensive cuts.

Fats and Sugar

An average of about one-half pound of each per week per person, amount varying with age and activity.

Economical fats are butter, lard, salad oil, and peanut butter.

Economical sweets are molasses and sorghum.

Tea and Coffee
Moderate amounts for adults only, if desired.

Cod Liver Oil and Other Fish Liver Oil
For all babies, small children and undernourished adults according to physician's directions.

LOCAL market conditions, foods available, food values and costs must also be considered. The planning of the meals with all these considerations in mind is like playing a game. It has to be worked out for each individual family, but once the family has experienced its results and benefits to health and finances, they continue to play the game. An easy rule to remember in the division of the food dollar is:

20 cents or more for milk and milk products.
20 cents or more for fruits and vegetables.
20 cents or more for flour, cereals, and breads.
20 cents or less for accessories (condiments, tea, coffee, etc.)

Another opportunity the industrial nurse has to correct or eliminate some of the causes of nutritional deficiency is through the cafeteria serving the employees. Here her opportunities to teach food values, stimulate intelligent food selection, overcome perversity of appetite, introduce new protective foods to the individual and eliminate faddism are manifold!

These opportunities may be capitalized on by the use of the following methods.

Serve only wholesome, nutritious and suitable foods at cost price or near cost price at the cafeteria. (Hot dogs, candy, coca cola, hamburgers and pastries are not essential foods.)

Have a nutritious balanced plate lunch available every day at reduced cost. Include raw vegetables, milk, whole grain breads, or fruits frequently with other foods of popular choice. This is a means of frequently introducing an important food, though long foreign to the individual, into his dietary.

When a new food is introduced into the cafeteria, if possible, give a small amount free as a taste, the first day it is introduced.

Have attractive posters on the walls of the cafeteria denoting the requirements of a balanced lunch.

Use enlargements of the food share cards (in references) to show the employees the food values of the various foods. Contrasts between lunches of a meat sandwich, pie and coffee vs. egg salad sandwich on whole wheat bread, orange and milk are excellent means of visual education.

Use your cafeteria as a means of supplying your employees nourishing noon meals to help combat malnutrition and maintain health and vigor; also as a center for the teaching of proper food selection and of good health habits.

There are countless other opportunities, too numerous to go into in this short period, that the industrial nurse has to combat undernutrition. An alert, interested nurse will see these opportunities open to her every day in her contacts with those with whom she is working and will capitalize upon them! Only when the value of an abundant, well-balanced diet which includes all the protective foods is more widely appreciated, when the hazards of those borderline states in which nutrition is barely adequate are better understood, and when people are willing and interested enough to use this knowledge, then the frequency of nutritional deficiency will be lessened and the nutritive state of the nation will be greatly improved.

Fatigue and Employment

Roy R. Jones, M.D.,
Surgeon, Division of Industrial Hygiene,
National Institute of Health,
United States Public Health Service

NUMEROUS studies and investigations have shown that there is a relationship between that physical status termed "fatigue," and efficiency of production, accident rates, and health status. From the viewpoint of the industrial physician, the practical question suggested by the title is, "How may our knowledge concerning the cause and effect of fatigue be applied in the promotion of an Industrial Health Program?"

Definition of Fatigue

FATIGUE is a term applied to various related phenomena. Collier[1] has stated: "Fatigue is a state of the human organism in which there is a significant lack of balance between intake and output of biological energy." As regards clinical evidence of fatigue, Gillespie[2] has stated, "A person is fatigued when he is capable of less general activity than would be expected from his general mental and physical equipment, and when the diminution of activity is accompanied by a sensation of fatigue, exhaustion or weakness."

Nature of Fatigue

WE MUST differentiate between the temporary and normal tired feeling commonly experienced at the end of a reasonable period of activity, and the morbid chronic form of fatigue. In case of the latter, there is a gradual decrease in biological energies and an accumulation of the chemical products of nerve and muscle action and of the effects produced by repeated stimulation of the emotional and other nerve centers, resulting in abnormal organic and functional changes. In its incipiency, chronic fatigue may be recognized as nature's warning that the limits of physiological activity are being approached. Although fatigue as a state of the human organism is not accepted as a clinical entity, nevertheless, it has long been thought to precede and contribute toward the development of acute and chronic illnesses.

Research workers have chiefly studied fatigue in relation to its cause and effect. The economists and statisticians have measured the effects of fatigue upon production efficiency, as indicated by quantity and quality of production, material

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wasted, labor turnover and accidents, and the physicians and physiologists have endeavored to determine what body changes, organic and functional, take place in the production of fatigue.

The literature dealing with the many aspects of fatigue is voluminous. Such reports as those published by the British Ministry of Munitions,[3] Lee, Florence, and their associates in the United States,[4] and time and motion studies reported by Gilbreth,[5] may be cited as providing abundant statistical proof of the effects of fatigue upon production efficiency. In the main, these reports indicate that the so-called "fatigue state" which lessens production efficiency is of an extremely complex nature, and that it is impossible to consider separately so-called "industrial fatigue" from that resulting from other metabolic and environmental factors affecting the individual.

Dill[6] and his associates, in discussing industrial fatigue, have called attention to certain physical states observed. They consider that the accumulation of lactic acid is a notable feature. Although knowledge of its concentration in the blood may be a useful factor when judging fatigue, it is not to be considered the toxin acting as a primary cause of fatigue. Lactic acid concentrations were shown to be a useful index of fatigue associated with a deficient oxygen supply or when the oxidative mechanism of the muscle is not competent to meet demands placed upon it.

As regards exhaustion of energy reserve, the authors concluded that "Even in heavy industrial work, fuel depletion and in particular carbohydrate depletion, is not an important cause of fatigue." They stated, however, that possible exceptions to this conclusion may be noted in the case of workers with a low reserve returning to work after a prolonged period of unemployment.

After considering the fact that inadequacy of oxygen supply contributes to break down of normal physiological processes and that alteration in physio-chemical state may be observed, and citing reports of numerous investigators in this field, they conclude "that the various mechanisms are not mutually independent and there appears to be little prospect of developing a simple and adequate hypothesis regarding the origin and nature of fatigue."

Results of studies of psychological changes associated with varying amounts of physical activity and conditions of exposures are generally applicable to the problem of fatigue and employment, in which the industrial physician is interested. The psychological reactions to a given stimuli will vary not only within groups of individuals but from hour to hour and day to day in the same individual, frequently regardless of environmental conditions and state of activity. The psychologist does not measure fatigue but rather the expression of fatigue as reflected in the individual's specific and general reactions.

Concerning specific fatigue tests of a psychological and physiological nature, the attitude of many, I believe, has been expressed by B. Muscio[7] which he stated in his article entitled "Is a Fatigue Test Possible?" His conclusion in substance is:

"That the term 'fatigue' be absolutely banished from precise scientific discussions and subsequent attempts to obtain fatigue tests be abandoned.

"That the problem to be investigated be defined as the determination of the effects of different kinds and amounts of work upon mental and physiological functions. For example, that the kind and amount of work be correlated directly with changes in psycho-physiological functions and not indirectly as by means of fatigue. The various so-called fatigue tests would then be used to determine the effects of activity and not the presence or absence of fatigue.

"It is worth noting that the mere demonstration of the presence of fatigue at a given time has no practical significance whatever. The practical question asks at what point fatigue becomes inimical to efficiency and health."

Diagnosis of Industrial Fatigue

THE diagnosis of fatigue as one of the primary causes of ill health, accidents, or decreased working capacity is difficult to establish without special study and is usually arrived at by the process of eliminating other possible causes. In the individual, evidence of the role played by industrial fatigue is even more difficult, if possible, to establish. The part played by industrial environment in the production of fatigue affecting a specific group of employees may, it would seem, be more readily observed. Collier[1] has termed this a "collective diagnosis of industrial fatigue." Such a diagnosis is warranted whenever a change in health status occurring in a significant percentage of a group at work may be correlated with quantitative and qualitative rates of production, labor turnover, accident and absenteeism records in the absence of other causes such as specific toxic agents in the atmosphere.

It is obvious, considering the industrial physician's responsibility for detecting evidence of industrial fatigue, that he must, in addition to studying illness and accident records, be familiar with plant operations and materials and have access to information dealing with production efficiency and labor turnover.

Practical application of our knowledge regarding the physiological and psychological aspects of fatigue in industry requires a cooperative approach by management and the physician in the consideration of those industrial conditions which may contribute towards fatigue. Although not altogether inclusive, for convenience some of those conditions of employment believed most important may be classified as follows:

I. Industrial methods and practices:
  A. Character of supervision of workers.
  B. Rate of work.
    1. Piece work.
    2. Scheduled output—assembly lines, etc.
  C. Hours of work.
  D. Rest periods allowed.

II. Environmental conditions:
  A. Lighting.

B. Working space.
C. Temperatures and humidities (sudden changes in temperature).
D. Abnormal atmospheric pressures (caisson workers).
E. Character of ventilation.
F. Personal protective devices.
G. Noise.
H. Posture.

Prevention of Fatigue in Industry

IT IS the industrial physician's duty to emphasize to management the health prevention aspects of industrial methods and practices. The individual's reaction toward supervision, particularly the new employee, has much to do with energies expended. Close and sympathetic cooperation on the part of the beginner's supervisors will do much to lessen the mental stress under which he may be working. Hours of work and speed are inseparable. Fortunately, the value of rest periods and reasonable hours of work is clearly demonstrated by production efficiency and is usually given consideration by the management. In some instances, however, particularly in the case of new employees and piece workers, failure to recognize fatiguing effects may possibly result in changes in the mental and physical health of the workers before production deficiencies are evident. If the family doctor or plant physician, in considering illnesses treated, will inquire into this phase of industral environment, he may frequently render a valuable service to the patient and his employer alike.

An appreciable deficiency of light in work places is likely to be reflected in decreased production and increased accident rates prior to any evidence of its effect upon the health of a group. Glare or unnecessary light is quite another matter. Whether or not continuous exposure to glare will definitely lessen visual acuity, it will cause eye strain shown to contribute to fatigue, headache, and related complaints.

The arrangement of processes within the plant so as to provide adequate working areas, will frequently lessen nervous and physical activities, and at the same time increase production. Crowded quarters will permit an increase in any atmospheric contamination resulting from operations carried out; lessen the amount of fresh air available per employee; increase chances of the spread of respiratory diseases particularly; and frequently will call for the unnecessary rehandling of materials and equipment used.

Research studies and investigations have shown various metabolic changes resulting from exposure to abnormal temperatures and humidities. Likewise clinical studies have demonstrated these effects objectively and subjectively in workers employed under such conditions. The frequency of pneumonia and chronic vascular changes in these employee groups has been shown to be excessive. Although it may be difficult to eliminate such exposure in certain types of work, proper attention given to the duration of exposure, and particularly the avoidance of exposure to sudden changes in temperature and the provision of adequate change quarters, will do much to lessen chronic fatigue which otherwise may develop. Use of salt tablets has proven helpful for men likely to suffer from chloride deficiency lost through excessive perspiration.

Men employed in the construction of tunnels, and divers who must work under increased atmospheric pressure, are probably exposed to the most abnormal and fatigue producing environment known to industry. Especially is this so in the case of the caisson or tunnel worker who is also frequently exposed to excessive temperature and humidity as well. Not only does this work require strenuous muscular effort, but from the psychological and physiological viewpoint, should and does cause a depletion of energy reserve. Experience has shown the wisdom of limiting hours of work under such conditions and the providing of additional carbohydrates and chlorides to make up for carbohydrates utilized during periods of unusual oxidative metabolism and for chlorides lost through excessive perspiration. Although compressed-air illness is primarily due to the formation of nitrogen bubbles in the tissues following too rapid decompression, exhaustion may also be a contributory factor since bends have been reported to occur most frequently among new employees on whom environment exerts a greater influence, and also more frequently following the second shift of the day.

Organic and functional changes due to insufficient oxygen supply and altered oxidative mechanism of the tissues may result from faulty ventilation. Atmospheric contaminants, when absorbed, may act as toxins and place an extra load on metabolic processes, particularly those of excretion. Thus jobs which do not tire one normally, may prove excessive for workers whose reserve energy is lessened.

Frequently the first evidence of harmful exposure to injurious substances in the air breathed is either increased irritability or sluggishness and loss of interest in work and surroundings, in some instances a condition quite characteristic of physical and mental exhaustion.

One factor occasionally overlooked is that personal protective devices furnished employees may, although they prove quite efficient, at the same time contribute towards fatigue. To breathe through a filter-type respirator requires extra effort; although resistance may be so slight that the wearer soon becomes accustomed to it, the fatigue stimulus remains regardless of this apparent accommodation.

The fatiguing effects of noise may be quite variable. Some quickly adjust themselves so that the reaction may be localized in the hearing mechanism. Possibly the most marked effect of noise in the production of fatigue is exerted upon the new employee or upon the apprentice who must exert extra effort to interpret oral directions necessary during his training period. For this reason, one working alone is less likely to notice the fatiguing effects of noise than those working

in groups where conversation will occur and require added effort and attention on the part of both the speaker and his listener.

The possible relationship between posture at work and ill health has been studied. When work benches provided are so low as to cause unnecessary stooping, they may usually be altered at very little expense. To the extra energy required for muscle balance in assuming abnormal positions is frequently added an embarrassment of respiration and circulation. When possible, all seats provided for men at work should have proper back rests, and when of such height that they do not permit the individual to rest his feet upon the floor, foot rests should be supplied. Backache and other complaints have sometimes been found to be due to the wearing of ill-fitted shoes. High heels require added effort for balance. Occasionally the wearer will use shoes with the heels worn low or to one side which causes him to spend added effort when walking or standing. The plant physician is in a position to recommend corrections of this nature to the employee.

As a general rule, most satisfactory results in the practice of preventive medicine are obtained when the program is designed primarily to serve groups rather than individuals. A well organized industrial health program should consider the elimination of industrial conditions likely to contribute toward unnecessary fatigue. Adult hygiene problems associated with the worker's occupation include more than a study of conditions causing specific occupational disease. Rest is a recognized necessary adjunct in the treatment of any illness or injury and so loss of reserve energy may play a contributory role in the development of general illnesses, as well as specific occupational diseases.

A study of changes in health status and absenteeism among industrial groups correlated with conditions of their working environment, offers a most promising means of determining the relationship of fatigue to employment and will indicate needed control measures.

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Organic Nervous Disease

—Commoner Signs and Their Significance—

George W. Hall, M.D.,
Chicago

IT IS the opinion of many general practitioners and surgeons that an examination of the central nervous system is a very difficult task. Consequently it is my purpose to bring to your attention certain definite signs and syndromes which if properly interpreted will render the task much less difficult and at the same time will enable those who are not specializing in diseases of the nervous system, to obtain a very good idea as to whether they are dealing with an organic or functional disease. Of course the most important part of the examination is obtaining a very clear and exact history of the onset of the disease as can be elicited from the patient, if one will take the time to thoroughly question him. The next important thing perhaps is a general inspection of the patient when sitting, his gait when walking, observing carefully for the presence or absence of tremors of the hands or arms, and at the same time to note whether or not he uses one leg better than the other while walking across the room.

Argyll-Robertson Pupil is, as you know, a pupil which does not respond to light but does respond to accommodation. This sign was first described by Dr. Doughlas Argyll-Robertson whose father was an ophthalmic surgeon, and he himself was educated in Edinburgh, St. Andrews and Berlin where he studied ophthalmic surgery under von Graefe. He was one of the few men who from the beginning of his career devoted himself exclusively to ophthalmic surgery. The Argyll-Robertson pupil at one time was thought to be pathognomic of locomotor ataxia, but in more recent years we have discovered it may be present in cases of post-encephalitis and multiple sclerosis.

Romberg sign was first described by Romberg in the year 1840. His writings were chiefly of vascular diseases of the brain, and he was such a student of the central nervous system that he was regarded as the father of scientific neurology. The description of the Romberg sign was brought about through his examination of a case of tabes dorsalis when he noted that when the patient closed his eyes while standing in an upright position, he tended to sway. The same difficulty was observed while walking across the room in a straight line.

Another important sign is the loss of abdominal reflexes. This was described by Eduard Müller in 1905. He especially emphasized the importance of the absence of abdominal reflexes as an early symptom in the diagnosis of multiple sclerosis. He also states that the cremasteric reflex in man was usually absent in the early stages of multiple sclerosis.

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BABINSKI first described his well-known sign in 1896. This is perhaps the most important sign of all relative to establishing a definite organic disease of the central nervous system. This sign is present when there are organic changes in the pyramidal tracts leading from the cortex of the brain down through the cord to the anterior cells of the spinal cord. When any such involvement is present the Babinski sign is positive, ie: when irritating the plantar surface of the foot the great toe will extend upwards whereas the other toes will flex downward. This sign is of course unilateral in cases of hemiplegia due to organic disease in the internal capsule of the brain or may be on both sides when there is involvement of the lateral tracts of the spinal cord. This necessarily occurs only when there is a definite involvement of the upper motor neurone.

KERNIG sign was first described by this author in the year 1884. This sign is present in the majority of cases of meningitis. It is obtained by having the patient lie down flat on his back and attempt to extend the knee with the thigh flexed upon the abdomen. The leg can not normally be extended at right angles. In other words, one succeeds only to an angle of about/35° without producing severe subjective pain.

HORNER'S SYNDROME was first described by J. F. Horner and consists of a drooping of one eyelid, a narrowing of the pupil on that side with an endophthalmos, or bulb that is sunken in. This syndrome is due to involvement of the sympathetic fibers arising in the neck. This is a symptom which is present in cases of cervical rib or where there is pressure upon the brachial plexus by the muscle, which gives a similar picture to that of cervical rib. This may also occur in other diseases involving the cord, such as syringomyelia and occlusion of the posterior inferior cerebellar artery.

There are many other signs and syndromes of less importance, and really of value only to those specializing in this particular branch of medicine. If the general practitioner will study the signs as mentioned above and can properly elicit them, he can at any rate satisfy himself that he is dealing with an organic involvement of the central nervous system, or that the case is not entirely a functional one. One must also keep in mind that the organic and functional can go together in the same patient, as one finds frequently in cases of multiple sclerosis. Oppenheim of Berlin has made this statement in his textbook on Neurology. The general practioner comes in contact quite often with the rather obscure uncertain abdominal pain which does not fit in with actual disease of any of the abdominal organs. He must recall that such abdominal pain occurs in so-called cases of gastric crises. Many cases of gastric crises, which is always syphilitic in origin, may be classified as pain due to gall stones, intestinal obstruction, etc. If in the course of a routine examination, the general practitioner will test out the pupils for the presence or absence of an Argyll-Robertson pupil, and the knee jerks, to note whether they are present or absent, he perhaps will not commit the error of mistaking the diagnosis, and recommending unnecessary operation.

Conservative Treatment of Fractures

EDWIN W. RYERSON, M.D.,
Chicago

THIS is going to be a very informal talk about fractures of the long bones. For more than 35 years I have been interested in fractures and during that time I have seen the rise and fall of a great many varieties of treatment. The conditions are different now from the days of thirty-odd years ago, because the automobiles nowadays go 40 to 50 miles an hour and we have to be pretty good dodgers to get out of the way. In the old days there were no automobiles and it was not so hard to get out of the way of horses and buggies. Another problem has arisen in regard to insurance companies; they want to hurry everything. We have to get these people well as fast as possible, and if there is one thing in the world you cannot do it is to hurry a fracture. It still takes just about so long to get well.

Nowadays a great many very good surgeons seem to have forgotten the value of traction in fractures of the long bones. A modern surgeon, on having a fractured humerus or a fracture of the femur come onto his service, will say to himself, "Had I better wire this, or had I better put in a Lane plate or a Sherman plate or a vitallium plate, or had I better transfix the fracture ends with long screws or nails, or had I better put in a Steinman pin or a Kirschner wire in order to get traction?" In most cases you do not really have to use any of these things, if you know how to put on a Buck's extension, and how to use the flexed knee in the Hodgen splint or the Russell traction in fractures of the femur. In 99 cases out of a hundred you can get a perfectly satisfactory result in just as short a time and in many cases in a great deal shorter time than if you operate on this fracture and fasten it up with a beautiful looking plate. If you operate upon a fracture, you remove a good deal of the surrounding blood clot that furnishes a lot of valuable nutrition in the healing of the fracture. It takes four to six weeks longer to get a solid union of that femur if you have operated upon it than if you had simply applied an extension apparatus and waited until the bones grew together. A good many years ago Allison and Brooks, in an article, showed by careful experiments that it takes about 120 days for a fracture of a long bone in an adult to become solidly fused. The bones are not solidly fused in less than 120 days, and no insurance company in God's world can make it grow together any sooner than that. So, if you are called upon to take care of a fractured femur, have that firmly in your head;

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that it will take about four months for that bone to get solid enough for a man to bear his weight on it.

Ever since Sir Arbuthnot Lane came here 29 years ago and talked of the advantages of the Lane plate, I have seen the results of many plating operations done by other surgeons and by myself. At the meeting of the American Orthopedic Association in Buffalo last June one of the great surgeons of America read a perfectly delightful paper about the advantages of immediate plating in fractures of the long bones. He has a splendid institution with a highly trained staff of assistants, and everything is done that it is possible to do. The operations are carried out with dexterity, and the rate of infection is low. I have no doubt that they are perfectly honest in saying that their rate of infection is very low, but the conditions are different in many other hospitals. Many men treat fractures of the long bones who do not have a perfectly-run hospital with every possible convenience and precaution; they do not command a staff of trained assistants, and I do not think it is wise to teach such men that the only proper way to treat fractures is by the plating operation.

The way to look at the treatment of a fracture is this: Suppose you are the fellow with the fracture of the femur and you are living in a small town with a pretty good hospital but no trained assistants. Would you want to have your leg cut into and a six- or eight-screw Lane plate put in, and then have to lie around to see if it would get infected or if it would fail to unite? It is not safe for us to teach the men who do not have these superlative facilities that the wise thing to do is to operate upon all of these cases.

When I look back 35 years, we had many fractures of the long bones and we rarely considered operating upon them. We could, by careful work, apply traction so that the bones could be pulled down to the proper length. They could not always be fitted accurately to each other, and it is not necessary in a fracture of the femur or humerus that the bones should be in exact end-to-end apposition. It is desirable, of course, and everyone would like to be able to manipulate these fractures so that they fit perfectly together, but we cannot do it in a very large proportion of the cases. We can, however, succeed in producing good alignment and we can prevent shortening by utilizing the various methods of safe and sane traction and immobilization.

In fractures of the shaft of the humerus, a Jones humerus traction splint (Fig. IA-B) is extremely satisfactory except where the upper fragment is abducted too far by the pull of the deltoid. If this happens, and the coaptation splints do not control it, an aeroplane splint or a plaster of Paris spica cast will support the arm in the abducted position until union takes place.

Nearly all of the many cases of non-union of the humerus which I have seen have followed wiring or plating operations performed by competent surgeons, and without any infection whatever. I have come to believe that the open operative procedure itself has been responsible for the non-union, perhaps because of the stripping-off of the periosteum, and perhaps because of the removal of the important blood-clot. In a very few cases, too much traction may have separated the ends of the fragments so far that the gap could not be filled up with new bone. The actual contact of broken bones almost always produces union.

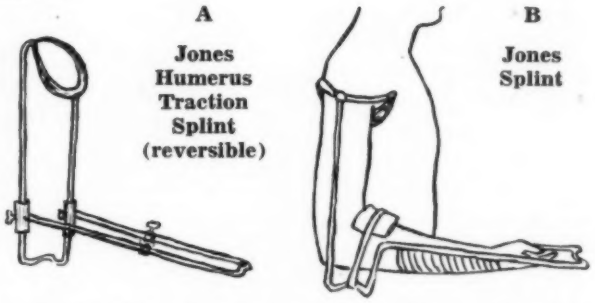

Fig. 1. Adhesive plaster traction straps may be applied to upper arm; or to forearm in fractures of radius and ulna

Femur Fractures

IN FRACTURES of the shaft of the femur it is very difficult to obtain accurate anatomical reduction by conservative means. It is, however, not at all necessary to obtain anatomical apposition in the vast majority of cases, provided that the alinement of the fragments is satisfactory and that the shortening is overcome. In children, even the shortening will take care of itself as the months go by.

The problem, then, is to pull down the leg until it is as straight and as long as the normal leg, and to hold it there until it unites. You do not need to worry about interposed muscle or soft tissues. It is the rarest thing in the world for a femur fracture to fail to unite on account of interposed soft tissues.

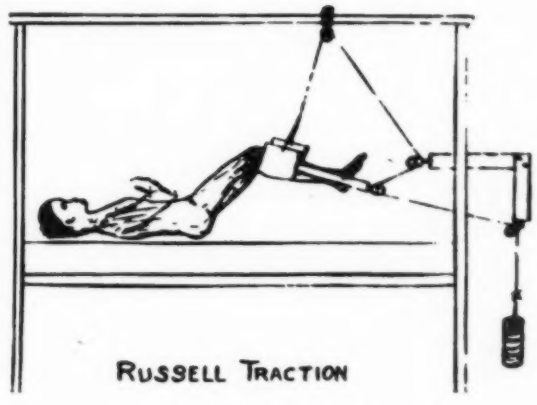

Fig. 2

The safest and best way to treat a fracture of the femoral shaft is by traction in bed with a Balkan frame and with a Thomas splint which has a Pearson half-splint at the knee to allow flexion of the knee. The Russell system of traction (Fig. 2.) is an excellent method, and even simpler than the Thomas splint, but it does not furnish quite enough stability of the thigh unless

narrow coaptation slats are bandaged snugly around the femur.

Zinc oxide moleskin adhesive plaster is satisfactory in most cases for applying extension. A long strip should be applied to the thigh and leg, for the ordinary Buck's extension, and narrower strips should be wound spirally from the ankle upward around leg and thigh to the top. These strips are sewed or stapled to the main strip at the ankle, and serve to hold the main strips firmly to the skin and also to distribute the pull more evenly over the limb. (Fig. 3.) If adhesive plaster slips, or causes too much irritation, cotton flannel strips can be fastened to the skin by Sinclair's or Heusner's glue, or by one of the newer glues, such as the Ace or B.D. glue. Webbing tapes are sewed or stapled to the end of the adhesive strips at the ankle.

Now, do not get the idea that you can treat fractured bones by these conservative methods without the most careful personal supervision. You cannot put up such a fracture and then go away on a month's vacation. You cannot leave the details to any one else. You must go in every day yourself and see that the traction is working properly, that the pulleys are oiled, that the position is correct, that the adhesive is not cutting the skin, and that the circulation is not impeded.

Besides this, you must tell your patient that, in all probability, the x-ray films will show an imperfect apposition of the fractured fragments, but

Fig. 3. Buck's extension with webbing tapes and buckles

that the functional result will be entirely satisfactory. If he is not satisfied with this prospect, and is willing to assume all the risk of an open operation, your conscience will be clear, and you can proceed to do anything that your judgment and your training may dictate.

Skeletal Traction

SKIN traction cannot be used in some cases, such as compound fractures with severe lacerations at the knee and the ankle. The Steinman pin and the Kirschner wire are very useful when properly applied. After being drilled through the bone, they must always be securely anchored to the limb, so that they will not slide to and fro in the bone and the skin. Perhaps the best way of fastening them is to apply a short plaster of Paris cast over the dressings, incorporating the pin or the wire solidly in the cast, so that it cannot slip.

Open Operations

A FEW fractures unquestionably do need open operations, when the patients are good enough surgical risks. Fractures of the patella, the olecranon and the neck of the femur have a better prospect of a perfect result by internal fixation than by external fixation, but in the case of the femoral neck fracture the operation requires the highest grade of surgical skill, and should be performed only by men of great experience. The whole field of open operations upon fractures is somewhat controversial even at the present time. Scarcely a month goes by without the appearance in the literature of several new gadgets or metals or devices for the treatment of fractures. If no surgical wounds ever became infected, our fracture problems would be simple. We should still have to worry about aseptic necrosis of the head of the femur, and about the remote possibility of non-union in a simple long-bone fracture, but we could cheerfully nail and plate with a clear conscience.

Let me conclude this dissertation with my own personal opinion: I have operated upon a great many fractures; I believe that the best fracture surgeon is the man who can get satisfactory results with the fewest open operations.

The Principles Involved

—in the Operation for Internal Fixation of Fractures of the Neck of the Femur—

RALPH G. CAROTHERS, M.D.,
Cincinnati, Ohio

SINCE Smith Peterson described his cases of internal fixation of fractures of the neck of femur, a considerable number of surgeons have written articles on this subject. Practically all of these articles have been confined to the technique of the operation, apparatus used and results. In few of them have the principles involved in these cases been discussed. It is true Smith Peterson pointed out these principles in his original article but with the desire to improve upon the technique or to make the operation more simple or to develop some pet gadget of this or that operator, the discussion of these principles has become almost nil and, as we examine many of the methods proposed, it is quite evident that in many instances all ideas of principle have been

It is not our purpose today to describe any particular technique or to praise or condemn any of the many gadgets now on the market but merely to describe what we believe are the essentials which must be remembered if one is to complete his case successfully.

First and foremost, it is absolutely essential that the fracture be well reduced. Smith Peterson in his original communication described an open operation in which he laid bare both fragments so that he could see the reduction and know that it was perfect. It was not long until the so-called closed or blind method of pinning was developed and as a result this particular principle has in many instances been neglected. It is not essen-

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tial that both fragments be actually seen as they are in the Smith Peterson operation, for accurate reductions can be determined with the x-ray if it is properly used. But, as we said before, the reduction must be good and it must be maintained throughout the operation until the pin or pins are completely in place.

Methods are described in which, after one x-ray has been made, the leg is rotated through 90° in order to get the other x-ray without moving the x-ray apparatus. While it may theoretically be possible to do this without disturbing the reduction one has accomplished, it seems to us that the danger of unreducing the fracture is very great when this procedure is carried out. We make it a practice therefore to fix the limbs and pelvis of the patient so that once the reduction has been made, the fragments will remain reduced until the operation has been completed. It is not difficult to move the x-ray apparatus in order to get films in two planes, and if the patient is held in fixed position, one can feel reasonably certain that the reduction one sees in both planes is a fact, not a guess, and that reduction will be maintained throughout the operation.

There is one other point in the reduction that is important and yet is rarely mentioned in the communications now published. The fragments must be reduced either in a perfect position or with a slight valgus deformity. One can not tolerate a varus deformity, even of a slight degree, but, on the other hand, a slight valgus deformity is a distinct advantage. It was long ago noted that cases which came to the hospital impacted in slight valgus were the ones to heal with the Whitman spica more promptly and more firmly than were others. Therefore, if any variation in the reduction, aside from absolutely perfect reposition of the fragments, is to be made, one should err in this direction.

The second principle resolves itself around the selection of the proper method of internal fixation and proper application of it. Whatever type of pin or nail is used, it must so fix the fragments that no amount of ordinary use of the leg, such as moving about in bed, getting into a chair, and even early weight bearing, will cause the reduction of the fragments to be disturbed. This means that the pin or pins must be so introduced that both fragments are held firmly together in an impacted position and the pin or pins must have such a grip on these fragments that ordinary use will not cause slippage, rotation or any other disturbance of reduction. Pins which do not go in deep enough and do not get a good hold of the cortical part of the upper fragment will very quickly work loose. Pins which have not a head so that the outer fragment can be driven against the inner for impaction will not maintain reduction. The length of the pin must be such that these foregoing details are accurately observed. In order to accomplish this one must have a pin either with an adjustable head (the Austin Moore type) so that the length can be changed at will during the operation and the excess of pin cut off, or if this is not the case, one must use some method by which a pin of exactly the proper length can be selected in the first place.

Further than this, it is essential that the material for internal fixation must not be flimsy. If the bone is either badly pinned or the material used is so flimsy that good reduction can not be maintained even though the leg is moved about, in other words, if any kind of retentive apparatus is necessary, then we have lost one of the greatest advantages of this operation over the closed method of treatment.

It must not be forgotten that the death rate from fractures of the neck of the femur is still high. This is caused, of course, partly because of the age of the average patient who receives such an injury, but primarily due to the consequent pain of irritation from improper fixation, and hypostatic pneumonia from recumbency. The Whitman spica, which in its day, represented one of the great advances in the treatment of these cases, was principally designed for the purpose of permitting patients to be moved about, sat up and turned over. The internal fixation goes a step further and when properly applied permits the patient to be got out of bed entirely within a very few days and it is in this regard that the treatment is an improvement over other methods. We have had patients get out of bed themselves within less than a day following operation, and we have generally urged patients to get up within approximately a week. Some of these patients have walked on their legs, bearing full weight. This, of course, was not with our permission, but at the same time, it has happened to us and may happen again. Therefore, we must re-iterate that it is necessary that the material of internal fixation be sturdy enough to carry the body weight. As a matter of fact, those patients who did walk early have been the ones who have done better in the long run than those who would not or for some reason or other could not get up early.

In order that the body weight may be borne successfully on pins, it is essential that they be put in so obliquely that the upward thrust of the lower fragment is nearly parallel to the perpendicular. It must be remembered further that absorption of the neck frequently does occur by whatever method one treats the case and if pins are put in in various directions, the upward slipping of the lower fragment will be hindered. In other words, if multiple pins are to be used, they must be put in in parallel or nearly parallel. The Smith Peterson nail is really three straight pins which are connected together in the center and which always remain in the same relative position and of course are always parallel. If multiple pinning is used, we believe it is essential that these pins should approximate the parallel position of the three plates of the Smith Peterson nail.

We have had no experience with vitallium pins. The work of Venable in regard to the absorption of bone from electrolysis of metal is certainly very suggestive. However, it has been our experience that good mechanical placement of the metal is just as essential as the character of the metal it-

self. If a pin is driven into the center of the head, the upper part of it is lying in soft cancellous bone. If one has ever operated upon one of these cases or examined an autopsy specimen, he is struck with the fact that the inside of the head can be easily scooped out with a curet. It is quite obvious, therefore, that a pin which is driven only into this part of the upper fragment will easily become loose, and this failure of mechanical fixation has, in our experience, been the cause of more bone necrosis around the metal than has the type of metal used.

IN CONCLUSION: The principles of this procedure are: (a) Reduction of the fragments in perfect or slightly valgus position. (b) Maintenance of the reduction through the operation. (c) Proper placement of pin. (d) The use of well constructed pins of proper materials. (e) Early mobilization.

Treatment of Burns

THEODORE L. HANSEN, M.D.,
Chicago

THE treatment of burns is a subject that, no doubt, has been studied and discussed since the beginning of man, or since fire was first discovered.

I have a small book entitled "Course of Examinations on Anatomy and Physiology, Surgery, Chemistry, Materia Medica, Midwifery, and The Practice of Medicine, adapted to the University of Pennsylvania, and the other Medical Schools in the United States," by David F. Condie, M.D. This book was published in 1818, and I wish to quote the question and answer covering the treatment of a burn.

Q. "What is the proper treatment for a burn?"

A. "In cases of superficial burns, the application of cold water or vinegar to the injured part is to be preferred. But when the burn is extensive, and the part has been killed by the fire, the best application appears to be the basilicon ointment, thinned with spirits of turpentine, being careful in the application to confine it solely to the burnt surface, and not to permit it to come in contact with the sound skin. If fever arises to any extent, it is to be treated on the evacuating plan. If debility comes on, cordial remedies must be administered."

That was 120 years ago, and our knowledge of the pathology and treatment of burns has greatly increased since then. However, there is still no great unanimity of opinion as to what is ideal or the best treatment. This is substantiated by the fact that there have been such a large number and variety of methods advocated in the literature of recent years.

The phenomena induced by burns are not only local but general in action, and there are definitely reflex, biochemical and toxic phenomena. There is no doubt that the cause of death in severe burns is due to the general and not the local phenomenon, and it is also obvious that the general factor is precipitated by the local lesion.

Underhill, Kapsinow and Fisk[1] have adequately proved that the first ill effects of a severe burn may be a reflex shock phenomenon due to pain and fright. They noted that in animals burned under anesthesia the primary shock seen in the clinical case did not occur. In other experiments they showed that the primary shock occurred too quickly for it to be caused by an actual reduction of the total blood volume, and the explanation of a protein absorption product is not logical since there is a loss of the power of absorption from the burned area in the first 12 to 24 hours. In the light of our present knowledge of bacteria and their toxins it would not be reasonable to presume that the primary shock could be due to the absorption of a bacterial toxin. From these facts one can therefore reasonably assume with some certainty that in severe burns there may be primary shock due to pain and fright.

This primary shock is transitory and the patient either succumbs or responds to treatment within a relatively short time. This is followed by a secondary stage in which the clinical symptoms would likewise be called shock, and is the second stage of burns. It is concerning the etiology of this secondary shock that there is considerable controversy.

Up to the last few years it was generally accepted that the ill effects of burns during this stage were due to toxins liberated in the burned area by protein disintegration, and which were absorbed into the circulation. It was this theory that led Davidson[2] in 1925 to summarize the evidence in favor of this hypothetical toxin and present the tannic acid treatment of burns.

The toxin theory has been vigorously attacked by Underhill, Blalock, Wilson, and their colleagues.[3] Working independently this group obtained results so convincingly harmonious that a rapidly increasing group now deny the existence of the tissue toxin entirely, and a still larger group admit that if the tissue toxin exists at all it is responsible only in part for the deleterious effects of burns. The experiments of Underhill and his colleagues with burned tissue give the most convincing evidence against the toxin theory. These showed that whereas burns induce an increased capillary permeability the loss of fluid is external and absorption from the burned area does not take place at all for 12 hours, and but very slowly for 24 hours. In the experiments methylene blue injected into the burned area showed no absorption into the blood stream, and, more convincing, strychnine injected in lethal doses did not even produce convulsions.

Due to the increased capillary permeability a large quantity of fluid escapes from the body, varying with the area of burned tissue. It is estimated that, by comparison to animal experiment, a man weighing 150 pounds with one-sixth of his body surface burned, will lose 3500 cc. of fluid in the first 24 hours.

Analysis of this fluid shows it is so similar chemically to blood serum, that for all practical pur-

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poses it could be considered identical. It is also shown that there are no blood chemical changes which could not be due to this loss of fluid. Also, the blood pressure lowers directly with the curve of fluid loss. The conclusion drawn, therefore, is that the secondary shock is due to an actual reduction of the total blood volume. This reduction in blood volume can be replaced by intravenous injection of isotonic salt solution, but as Brandson and Hillsman[4] have pointed out, this does not restore the serum protein loss, and the lowering of the serum portein content of the blood alone is sufficient to cause shock symptoms and death even in the presence of a normal blood concentration.

The third stage of burn symptoms is generally admitted as due to bacterial infection. This is comparatively late, and the complications of burns usually appear during this stage.

The phenomena of severe burns must, therefore, be visualized as a sequence of events, in which the physiological and biochemical changes occur in an orderly manner.

At the onset of a thermal burn several things occur.

1. Pain and fright which may induce reflex shock.

2. Coincidentally increased capillary permeability with loss of fluid starting immediately, reaches its peak in 24 hours, is stationary for 24 hours, and then is slowly reabsorbed.

3. At the same time bacterial contamination may occur and become an active infection in 36 to 48 hours, and produce toxic symptoms.

The prognosis in burns depends on the amount of destroyed skin, and is favorably influenced by therapeutic measures. According to Riehl[5] the amount of burnt skin is estimated as follows: The surface covered by third degree burns is counted in its entirety; that of second degree burns is divided by three. First degree burns hardly come into consideration, except possibly with children. When such an estimate of burnt skin amounts to one-third of the surface of the body there is absolutely no hope for the case; only a few single cases are healed when the estimate of between one-fourth and one-sixth; with one-eleventh of skin surface involved, mortality still amounts to 50%.

As to the complications of burns one may justly assume that they all begin with and include the third stage, which is the stage of bacterial infection.

Septicemia: May occur more frequently than realized. Aldrich[6] found streptococci in the heart's blood of all his fatal cases of burns.

Tetanus: The nature of the trauma would eliminate tetanus, but might be contaminated by first aid applications. Occurs in very small percentage of cases.

Bedsores: Uncommon, but seen among the aged and those bedridden over long period of time without proper care.

Hemorrhage: Occurs only in a small percentage of cases, and is usually only in sloughing and badly infected burns. Patient is usually in poor condition when this occurs, and, it, therefore, may be quite serious.

Pneumonia: Is one of the more common complications in fatal cases of burns. In cases dying late in the course of the sequence, pneumonia or nephritis is the usual cause of death.

Nephritis: Kidney damage occurs early, in fact so regular and early that it may be classified as a part of the phenomena of burns and not a complication. With this early damage to the kidney in mind, care must be taken in the amount of fluid given patient after the first 48 hours. The damage to the kidney at a late stage of the sequence is no doubt due to bacterial toxicity.

Curling Ulcer: These have been reported throughout the gastro-intestinal tract, but are most common in the duodenum. First described by James Long[7] in 1840, and by Curling[8] in 1842. Although rarely reported they may be a frequent complication. Perry and Shaw[9] reported duodenal ulcers routinely found in 0.4% of all cases coming to autopsy, and in 3.3% of all cases autopsied after severe burns. As these ulcers do not produce symptoms unless perforation or hemorrhage takes place, and the mortality under these conditions is 100%, one may presume that a fair number occur which do not come to the attention of the surgeon. This is more reasonable when one realizes that these ulcers do not become chronic, but either perforate or heal.

Contractures: Is not a complication of burns, but rather a late result of the trauma due to excessive formation of connective tissue and resulting contraction of same.

THE treatment of severe burns is divided into two parts, the systemic and local. Much has been written proving or disproving the value of various types of local treatment while the general treatment has usually been dismissed very briefly. In my opinion, the general treatment is by far the most important in the treatment of severe burns, and the local treatment by comparison the minor problem.

The general treatment in severe burns consists of combating the initial shock and restoring the fluid loss which is certain to follow through increased capillary permeability.

The primary shock is treated by the judicious use of opiates to relieve pain. Heat is applied in the form of an electric crib to combat heat dissipation. Venous injection of isotonic salt solution is given to offset the relative reduction of the total blood volume. The amount of saline thus injected should be approximately 5000 cc. so that when the tone of the capillary vessels recover, there will be an excess quantity of fluid present in the circulation to combat the gradual loss of serum which will now follow due to the increased permeability.

To restore the fluid lost from increased capillary permeability the question is one of quantity and kind of fluid to be given. The quantity can be determined in two ways—first, the surface area involved; and second, the variations of red blood cell count and hemoglobin index. In computing from the surface area involved we know that an animal with one-sixth of the body burned will, in the first 24 hours, lose fluid equal to 70% of the

total blood volume. Therefore, in an adult weighing approximately 150 pounds the fluid loss would amount to 3500 c.c. The simpler and more accurate method of estimating the blood concentration is, of course the r.b.c. and hgb. index, the specimens of blood being taken each time from the same site.

Sufficient fluids should be used to restore blood concentration to normal and subsequently to maintain it within normal limits. There is little danger in giving isotonic solutions in large quantities during the first 48 hours, during which time the kidney function is apparently normal and will eliminate any excess fluid without harm to kidneys.[10] While salt solution will restore the blood volume and chloride balance it will not restore the loss of serum proteins, and, therefore, in itself is not adequate. The simplest way to replace serum proteins is by blood transfustions, and 1000 cc. should be given in the first 24 hours in an extensive burn. Some use whole blood while others prefer to centrifuge the blood eliminating the red cells from the blood used so as not to increase the r.b.c. count and hgb. index.

In the local treatment the wound should be treated the same as any other open wound, namely, thoroughly cleansed by removing all dead tissue and foreign particles, and washed at least with normal saline solution, to wash away contamination, and especially acrolein, a very irritating aldehyde formed by the breaking down of the tissue fat by the burn. This acrolein comes in contact with the exposed sensory nerves and causes the severe pain encountered in burns. This pain producing action of the aldehyde can be immediately and totally obliterated by changing it into the corresponding acid or alcohol.[12] When the wound has been thoroughly cleansed the desired local method of treatment may then be used.

As to this local treatment, no doubt the most popular method at the present time is the use of tannic acid, or some tanning solution. Some use gentian violet, which has certain advantages over tannic acid. Others use silver nitrate solution with both the tannic acid and gentian violet methods to hasten the eschar formation. There is no doubt that the tannic acid treatment has decreased the mortality in burns, and was a decided advance in burn therapy. All writers seem to agree that this type of treatment with the formation of a coagulum greatly decreases the loss of fluids from the burned areas. There are numerous disadvantages, namely the coagulum produced is coarse and tough and is impossible to remove without producing considerable bleeding and intense pain; and it furnishes ideal conditions for the formation of pus, which may spread over a large surface before noticed as it cannot perforate the coagulum and will destroy considerable of the young epithelium; in the region of a joint early mobilization may be prevented because of the toughness and non-elasticity of the coagulum.[11] Another disadvantage pointed out by Blair and Byars[13] who state "inasmuch as the leatherizing of the epidermis will greatly reduce the degree of anhydremia, the use of tanning solutions is pharmacologically rational for the prevention of body water loss. But as it is impossible to leatherize the dead tissue without also leatherizing to some extent both injured and uninjured tissue, repair of the burned area is thus impeded."

Frederick Taylor says:[14] "The dead epithelium is of course tanned rather rapidly. If the process stopped at this point the treatment could certainly be termed ideal. Unfortunately with the usual treatment the tannic acid continues to penetrate and tans the underlying viable epithelial cells, the very cells that might have taken such an active part in the regeneration of the surface epithelium."

As stated, acrolein produces the great pain present in severe burns, and tannic acid, or the other tanning solutions, does not affect this substance.[12]

Allen[12] states: "We find that the leatherizing treatment is effective in preventing anhydremia; that it does not control pain; that it increases liability to infection, prevents the elimination of effete tissue and seriously interferes with the production and proper distribution of reparative tissue."

Treatment with cod liver oil ointment apparently produces the lowest mortality to date, and Loehr[15] claims that it heals the greatest defects. He also states the method is simple and safe in inexperienced hands. Absolute painless after treatment is a great advantage. It can be applied to any part of the body, even to the face. Cod liver oil has the advantage of being sterile in itself, and investigations prove that bacteria cannot continue to exist in it, they being gradually annihilated. The so often found secondary infections following burns are thus prevented.

Loehr experimented to determine the difference between cod liver oil and tannic acid therapy. On the third, sixth, and ninth days fragments of the burned skin were excised for histological examination. The burns treated with cod liver oil were about three days in advance of those treated with tannin. While the cod liver oil treatment does not take care of fluid exit, this can be overcome by saline infusions, transfusions, etc.

Terrell[16] recommends Foille locally for burns. He claims more rapid healing with considerably less discomfort than those treated with 10% tannic acid.

There are a great many other preparations for local application, and most surgeons have their own favorite.

According to Juan Gautier[17] infra-red treatment is preferable to tannic acid. The rays can be used after other applications. After exposure of ½ to ¾ hour the analgesic effect is considerable and no sedative is needed. The burned area is protected by sterile sheets without dressings. The wounds dry up rapidly, especially when the ray applications are frequent. Gautier advises two treatments a day, each of one hour's duration.

Many surgeons still prefer the "open air" treatment, that is, the patient placed on sterile sheets, wounds without dressings but protected by a tent or cradle, the air within which is kept warm by means of electric lights.

The third stage of burns, which is due to bacterial infection, should be treated the same as any other bacterial infection.

In order to prevent contractures, adequate and correct fixation of the burned parts of the body is necessary. In cases with burns on the neck the patient should always lie without a pillow; extremities with burns should always be kept in a position of extension, and passive movements of the joints frequently made. Extensive granulating surfaces must have new skin grafted on early, as must also small areas in the region of the eye. Deep burns must always be grafted and not allowed to heal with extensive scar formation which greatly increases disability and loss of function. The contractures are due to failure to replace the lost tissue with grafts.

Padget[18] has developed an ingenious method for obtaining large skin grafts. He has perfected an instrument which will cut a large graft of skin at any desired thickness. It is not complicated and makes skin grafting much simpler than heretofore.

Keloids, which often occur in the healing of burns, can be easily and effectively treated with x-ray or radium.

IN SUMMARIZING we may say the treatment of burns is divided into two parts, the systemic, and local.

The sytemic, in my opinion, is much the more important, and consists of treating primary shock, restoring fluid loss, and maintaining blood and serum protein concentration, and the chloride balance, by means of saline infusions and blood transfusions.

The local treatment can be managed by any one of numerous methods, provided the systematic treatment is adequate.

I have pointed out the consensus of opinion of the medical profession in 1818, and we all realize we have learned a great deal about the phenomena of burns since then, but there still is a great deal unknown to us. I hope that long before another such era has passed we will have acquired a thorough knowledge of the phenomena of burns, and effected a standardized method of treatment.

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Control of Illness

—*In Industry*—

Michael Lake, M.D., F.A.C.P.,
Medical Director,
R. H. Macy & Co., Inc.,
New York City

THE question may well be asked "Why should industry be interested in the control of illness?" With the many problems which face industry today, we might think that it has enough scope for its energies and might leave the problems to the various public and private agencies primarily interested in health. However, we see a gradual extension of medical service in industry. This would indicate that such activities contribute to profitable operation.

Some of the costs of poor health to industry are:

1. Lowered efficiency of workers.
2. Higher labor turnover. A certain proportion of separations are due to poor health.
3. Higher absence rate.
4. Higher compensation costs. There is no doubt that the period of disability of an injured worker is lengthened if he is chronically ill. Some evidence is also accumulating that the accident prone individual is also prone to repeated disability from illness. There is also no question but that certain physical defects or chronic ailments are responsible for some accidents. For example (and these are actual cases) an elevator operator with epilepsy, a truck driver with poor vision, a furniture mover with relaxed inguinal rings, an armed special officer with delusions of persecution. Recently, compensation is being more frequently granted for occupational aggravation of heart disease and even of tuberculosis.

Disability due to illness is 16 times as frequent as that due to industrial injuries, and the indirect cost of this disability is just as truly present. The cost of hiring and training a new employee to replace one with tuberculosis is no less than if he had been injured in a plant accident. Also, many employers bear some of the direct cost of illness, either by contributing to a sick benefit fund or by paying wages for these absences.

Dr. Gafafer has told you that the annual days lost per worker in the United States because of illness or injury are 7.5 days for males and 10.9 days for females. In an organization having 10,000 workers, for example, half of whom are women, 93,000 days would be lost each year. If the average

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wage is $4.00 a day, this would represent $372,000 in lost wages alone. You can see the tremendous possibility for savings in an attack on this problem.

What Can Be Done to Improve Employee Health?

MEDICAL departments in industry have gone through a long period of experimentation during which, having no experience to guide them, there was much lost motion and many mistakes were made. During the past 10 years a definite policy and program has crystallized, at least in the case of the larger companies. In the past three or four years the medical profession as a whole has taken an interest in learning something of this field of practice, and organized medicine in helping to guide its development.

Thus the American Medical Association now sponsors a Congress on Industrial Medicine, and the American College of Surgeons has taken upon itself to inspect these departments and issue certificates of approval.

The program which has been evolved is the result of actual experience and is based on the needs of industry and of the workers. Certain measures have been generally found to be effective:

1. The medical department, in cooperation with the plant engineers, is charged with the general sanitary supervision of the plant. This includes the recognition and control of any special hazards such as toxic dusts and fumes as well as the question of cleanliness, temperature, humidity, water supply, adequate lighting, inspection of kitchens, eating places, locker rooms and workplaces. It should also include the study of various processes from the standpoint of fatigue and the determination of adequate rest periods for various occupations.

2. Pre-employment examinations, in order to eliminate those who are physically unable to perform the work for which they are hired, without danger to themselves, to others, or to property. Many applicants with chronic defects or diseases may be safely placed in some occupations. For example, a man with poor vision may be safe as a helper on a truck, but may be a dangerous driver. Moderate hypertension, or a compensated rheumatic heart, may not be a contra-indication for clerical work, but would be for furniture loading. This examination also serves to make available an exact record of conditions present at the time of employment, thus protecting the employer from unjustifiable claims which may later follow an injury.

3. First aid for injuries and advice for acute illnesses occurring during working hours. The value of these measures is self-evident. The number of infections which follow injury can be greatly reduced by teaching workers to come for first aid even if the injury is very minor. In our organization this policy has reduced infection by 88% in five years. First aid kits should not be made available if the medical department is open. By seeing those who feel ill at work the doctor has the opportunity to detect acute appendicitis, pneumonia, measles, and many other conditions, at their onset and to advise proper care.

4. Visiting nurses. Many concerns have found the service of visiting nurses of great value. The purposes of this service are several:

(A) To see that the sick person is under medical care.

(B) To give bedside care under the direction of the family doctor.

(C) To report if any financial or home problems exist.

(D) To bring back information which will avoid any delay in the payment of sick benefits, if such a plan exists. Incidentally, these visits tend to discourage malingering.

5. Medical inspection before resuming work following illnesses. This is a valuable procedure in preventing complications and in the detection of contagious diseases. Our experience has been that about 10% of employees reporting for work are not yet ready to do so. In this group we find many individuals with fever, a few with unsuspected scarlet fever or diphtheria, and an occasional walking pneumonia. This procedure is very much worthwhile, and it is perhaps more valuable in absences of short duration.

6. The periodic examination. The measures already mentioned are designed to prevent acute illnesses and especially their complications, and to assure adequate care. To detect chronic illnesses, the periodic examination is essential. The more completely it is made, the greater its value. For example, by means of routine chest x-rays, many cases of early tuberculosis will be discovered that would be missed by any other procedure. Routine Wassermann tests are being generally included. An examination of the urine and of the blood is necessary. At this time the doctor has the opportunity of discussing the question of exercise, adequate diet and to detect mild nutritional deficiencies as well as physical defects which may cause disability in the future. It also offers the opportunity to study the possible relation of various symptoms and signs to occupation. Change of occupation may be recommended, and in some cases retirement.

This examination is the backbone of any preventive medical program.

It does little good to recommend a period of rest or an operation which is not urgently needed, unless it is made economically possible for the employee to follow your advice. Any effective program, therefore, should include some plan for payment during disability and additional income during hospitalization. This should take the form of a definite plan so that the employee knows exactly what he will get and makes his plans accordingly. Payments that are made merely at the discretion of the firm cause the individual worry and uncertainty, and this does not help his recovery.

For this reason I recommend a definitely established sick benefit plan, supported both by dues and by firm contributions, and administered by the employees themselves.

Relation to Management

MEDICAL records must be confidential. The management is entitled to information in terms of ability to do various jobs, but not in terms of disease. When transfer is recommended because of a physical condition, the management must cooperate to see that loss of employment does not result, except rarely in extreme cases. A pension plan is helpful in taking care of these few cases.

If the employees believe that medical information gets out of the medical department, or that loss of job follows medical examinations, they will lose faith in the medical department and its usefulness will soon end. The firm must be farsighted enough to realize that it benefits in the long run by this policy.

Relation to the Medical Profession

AN INDUSTRIAL medical department is a health department. Its purpose is to prevent illness. It should not attempt to replace the family doctor by offering treatment for chronic ailments. It can best devote its energies to discovering conditions which need care, and referring the employee to his family doctor for the actual treatment. It may, however, when the need exists, cooperate with the family doctor by making available expensive x-ray or laboratory procedures which the patient cannot afford. This will enable the doctor to make an accurate diagnosis.

In closing, let me stress that great opportunities exist in an industrial community for preventive medicine, and that this field of practice is deserving of the best in medical knowledge, medical equipment, and professional ethics.

Acute Traumatic Abdomen

RICHARD J. BENNETT, JR., M.D.

THE acute traumatic abdomen may be divided into three main types, namely: lesions of the abdominal wall; retroperitoneal lesions, and intraperitoneal lesions.

HISTORY: The history is very important in this type of work and an exact word picture of the manner in which the patient was injured is often an aid in the diagnosis. The question of how recently food and liquid have been taken and when the bladder was last emptied are also of value.

PHYSICAL EXAMINATION: The general appearance of the patient when he is first seen by the surgeon along with the pulse, the blood pressure, the presence or absence of tenderness and rigidity, and the laboratory data essential to the case are the basis for future observations. The period of observation may run from a few minutes to several days. It is only by means of repeated bedside observations at short intervals aided by essential laboratory data that the correct diagnosis may be made. No single plan for the management of this type of case can be laid down. No infallible rule exists largely because no two persons respond identically to the same stimuli.

DIAGNOSIS: During the period of diagnosis in cases of abdominal injury, the best procedure to follow is that of watchful waiting. A reliable intern on continual duty is a valuable adjunct to the frequent visits of the attending surgeon. No opiates or barbiturates should be given as well as nothing by mouth. External heat and the judicious use of intravenous saline or blood transfusions are of definite value. When the diagnosis of perforation can be made when first seen, operation is indicated immediately. This type of case when seen early rarely shows any signs of peritoneal infection. Nausea, vomiting, rapid pulse, abdominal rigidity, pain, tenderness and shock present a clinical picture that is unmistakable.

X-RAYS IN DIAGNOSIS: In many cases the x-ray is invaluable in diagnosis. In cases where there is a question of perforation of the gastro-intestinal tract, the diagnosis may be affirmed or denied by taking a flat abdominal plate with the patient in an upright position. In cases of perforation the presence of free air beneath the dome of the diaphragm can be clearly discerned and is pathognomic. Where it is necessary to transport or move the patient around considerably especially on several occasions, the procedure may be a definite liability. Hemorrhage, shock or visceral leaks are seriously aggravated by trips to the roentgenographic room.

SHOCK AND HEMORRHAGE: The entire picture may change in but a few minutes and it is impossible to differentiate between shock and hemorrhage. Common sense along with careful interpretation of all the signs and symptoms and laboratory data are essential in making the correct diagnosis. Careful observation may lead one to believe that there has been a hemorrhage within the abdomen but which has been controlled. This abdomen need not be opened. Hemorrhage and infection are the two great dangers in abdominal injuries. Shock may be due to hemorrhage, trauma, or of neurogenic origin. Any sharp blow to the abdomen or acute flexion of the body crushes and may open a hollow viscera, lacerate a solid organ or tear across mesentery or ometum. Shock is often a misleading symptom in penetrating wounds of the intestines. If seen within a short time following injury, shock may be quite evident and is often of neurogenic origin. The patient will often recover from this and seem much improved for a shorter or longer period of time until hemorrhage or infection develops. Pain is an inconstant symptom and not reliable. Muscle rigidity and tenderness are often absent in early cases. The operability of an intra-abdominal injury is usually based upon the surgeon's ability to gauge the physical status of the patient and to determine whether the dominating symptoms are due to shock, hemorrhage or peritonitis. A single examination is never sufficient to differentiate shock from hemorrhage. Repeated tests are necessary whatever method is used. The surgeon in these

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cases must bring into play his most profound judgement.

LABORATORY DATA: Laboratory data is of considerable significance in the diagnosis of traumatic abdominal injuries. A declining total erythrocyte count is indicative of hemorrhage. A rising leucocyte count suggests hemorrhage, intestinal obstruction or peritonitis.

PROCEDURES: When the diagnosis of a surgical abdomen has been made and the abdomen is to be opened, it is quite essential to get in and get out as quickly as possible with all due respect to the tissues, organs and the patient. A regular surgical operating team who has worked together for a long period of time is a great asset in this type of work. A perforation of any part of the gastro-intestinal tract means peritonitis and death unless the abdomen is opened and the perforation closed. It is quite simple to diagnose penetrating or perforating wounds of the abdomen when the wounds are evident upon the surface and can be followed into the abdominal cavity. In penetrating wounds the most likely course is that of a straight line but not so in gunshot wounds as the bullet may be found far distant from the course which one might anticipate. When it is known that the abdominal cavity has been penetrated, it is still possible that no intra-abdominal structure has been injured. There are only two ways to determine this, namely: waiting, and exploration. Waiting greatly increases the mortality so it is imperative to operate early. Hemorrhage and shock are recognized early; infection late. If the abdominal cavity has been penetrated then there is no choice of procedure—the abdomen should be opened at once. At the time of operation if there is some doubt as to whether either hemorrhage or perforation is present, a small exploratory incision may first be made. Upon exposing the external surface of the peritoneum if hemorrhage be present it presents a bluish appearance. On the other hand, upon opening the peritoneum, if free gas escapes then a perforation *must* be found and repaired. If either or both of these conditions are found the incision is enlarged. A fecal odor is especially noticeable when the perforation is low in the gastro-intestinal tract.

LIVER: The liver is considered first because injuries to the liver comprise about one-fifth of abdominal wounds. The liver is the largest solid organ in the abdomen and is relatively fixed in the right upper quadrant and is thus vulnerable to lacerations and crushing injuries. If bile escapes peritonitis results. Treatment: simple suture or pack and it is advisable to drain for a few days.

DUODENUM: The duodenum is mentioned only because it maintains a fixed position and is subject to less injury than other portions of the small intestine. Treatment: transverse mattress sutures so that normal diameter is not encroached upon.

SMALL INTESTINE: The small intestine is the longest piece of tissue in the abdomen and may contain multiple lesions. Most of the fatal intraperitoneal cases of hemorrhage die within a few hours of injury. Occasionally portions of mesentery are torn from the small intestine, bleed profusely accompanied by excruciating pain, nausea, vomiting and profound shock, followed later by gangrene, peritonitis and death. Routine careful examination of the small intestine in small segments should be carried out. The precepts that the surgeon should have the eye of an eagle and the touch of a woman, can well be applied here. About one-fourth of all penetrating wounds of the abdomen will enter the small intestine. The higher the level of perforation in the gastro-intestinal tract the better the outlook. Wounds of the stomach, duodenum, and upper jejunum have a much more favorable outlook than those of the lower ileum and colon. Treatment: pursestring suture of small caliber catgut on an intestinal needle. Drainage is advisable for 24 to 72 hours.

SPLEEN: The spleen is relatively more mobile than the liver but is still confined within fixed limits, more so if it is enlarged. In most instances there is but one safe procedure in cases of laceration of the spleen and that is splenectomy, no drainage being necessary. Wounds of the spleen are not so frequent as are those of the liver. There is no way to make a definite diagnosis before operation and when laceration of the spleen is suspected, operation is urgently indicated.

STOMACH: Injury to the stomach supplies about 10% of the abdominal wounds. The posterior wall of the stomach must be remembered and examined through the foramen of Winslow or through the gastrohepatic or gastrocolic omenta if indicated.

LARGE INTESTINE: Treatment in such cases should be by pursestring or mattress sutures. Always drain. Colostomy is occasionally indicated. Gas gangrene antitoxin should be given.

RETROPERITONEAL HEMORRHAGE: Large retroperitoneal hematomata may produce very confusing and disturbing symptoms. Treatment: watchful waiting.

PANCREAS: In injury to the upper abdomen, the pancreas may be injured. Spilling of pancreatic juice is very dangerous. Treatment: Mikulicz drainage.

GENITO-URINARY: In questionable cases of rupture of the bladder or injury to some portion of the genito-urinary tract, it is advisable to introduce into the bladder by means of a catheter a small quantity of sterile boric acid solution. If this solution is not returned in its entirety by the catheter, rupture of the bladder must be considered. Other procedures to be considered in this type of lesion are cystoscopic examination and the intravenous administration of a suitable medium to show the outline of the kidney pelves, ureters and bladder. Fracture of the pelvis may either produce injury to the rectum or the urinary bladder. In perforation of the bladder, the bladder should be closed with a pursestring suture or double row of mattress sutures and a retention catheter left in the bladder. When the perforation is retroperitoneal, the bladder should be repaired and then drained by a suprapubic cystotomy. In

ruptures of the posterior urethra, careful judicious soundings, and catheterization may be attempted with special precautions against a false passage. If this fails, suprapubic or perineal cystotomy may be performed with retrograde passage of sounds and catheters.

APPENDIX: It must be remembered that it is highly improbable that trauma can initiate appendicitis. The symptoms of appendicitis must follow the injury directly not weeks or months following the injury as is claimed by some workmen.

TRANSFUSIONS: Transfusion is one of the finest means of preparing the poor risk for operation. When no other source of transfusion is available then auto-transfusion at the time of operation must be performed if the blood is available. I have seen two cases of complete anuria following auto-transfusion, incidentally both cases recovered after a stormy convalescence. If there is hemorrhage in the peritoneum and a perforation of the intestine at the same time, do not use the blood for auto-transfusion as septicemia may result.

AN EMPIRICAL method of deciding whether operation should be performed or not is based upon six factors, namely: (1) general appearance, (2) pulse, (3) blood pressure, (4) tenderness, (5) rigidity, and (6) laboratory data. A plus (+) is used when the factor is considered favorable, a minus (—) when it is considered unfavorable. A majority of plus (+) means that operation is not indicated; a majority of minus (—) means that operation should be considered immediately when the balance changes to the (—) side.

1. *General appearance of the patient:* You all have probably walked into the room to see an acute traumatic abdomen and had the patient smile as you entered and say "Good morning, Doctor." On the other hand there is the example of the patient who is pale, practically unconscious and is aroused with difficulty.

2. *Pulse:* A full, regular pulse whose rate is under 120 and begins to stabilize under observation is in contradistinction to the thin, irregular, rapid pulse over 120 which does not respond to therapy.

3. *Blood pressure:* A blood pressure within normal limits for the age of the patient is always an excellent sign. A systolic blood pressure under 100 when it can be determined that the normal blood pressure is above that level is indicative of hemorrhage or shock or both. We must remember that hypotension is many times nature's method to reduce blood loss and allow bleeding vessels to clot. In attempting to elevate blood pressure too rapidly, we sometimes defeat Nature's efforts.

4. *Tenderness:* When entirely absent it is an excellent omen. When present it may be confined entirely to lacerated or contused structures of the abdominal wall, but when the peritoneal cavity is included, more careful differential diagnosis is indicated. Rebound tenderness suggests that the peritoneum has been invaded. In many instances the abdomen which was not tender early, later shows increasing involvement due to hemorrhage or peritonitis.

5. *Rigidity:* Here too the factor may be entirely absent early and respond to the stimuli of hemorrhage and infection later on. A board-like rigidity of the abdomen may be entirely due to muscle trauma.

6. *Laboratory data:* Rapid or slowly changing hemoglobin estimations, total erythrocyte or leucocyte counts must be respected, but not individually. Their changes must fit in to the case picture as a whole. It is hardly possible for one of these factors to change radically without causing significant changes in some of the other five factors noted. The finding of erythrocytes in the urine is very suggestive of genito-urinary pathology and pathognomic when corroborated by intravenous pyelograms, cystoscopic examinations, etc.

A flat x-ray plate of the abdomen with the patient in the upright position is pathognomic of ruptured gastro-intestinal tract when free air is found beneath the dome of the diaphragm. A flat x-ray plate of the abdomen showing distended small intestinal loops (ileus) may be decompressed by means of the Miller-Abbot tube when signs of intra-abdominal hemorrhage or infection are absent.

Do not hesitate to call in a consultant, one who has had more experience in this type of pathology than yourself. Remember the old saying: " 'Tis better to use the knife too soon and find our diagnosis wrong, than to hear that old familiar song—he's gone to join the heavenly throng."

CASE HISTORIES

	Favorable	Unfavorable	G.A.	P.	B.P.	T.	R.	Lab.
1.	****	.. ..	*	*	*	..	..	*
2.	****	.. ..	*	*	*	..	..	*
3.	****	.. ..	*	*	*	..	..	*
4.	*****	..	*	*	*	..	*	*
5.		.. ..Operated	..	..	..	..	..	..
6.	***	.. .. ..	*	*	..	..	..	*
7.		.. ..Operated	..	..	..	..	..	..
8.		.. ..Operated	..	..	..	..	..	..
9.	***	.. .. ..	*	..	*	..	..	*
10.		.. ..Operated	..	..	..	..	..	..
11.	***	.. .. ..	*	*	*	..	..	..

G.A.—general appearance. P.—pulse. B.P.—blood pressure. T.—tenderness. R.—rigidity. Lab.—laboratory.

CASE 1. Fractured pelvis. General appearance excellent. Pulse satisfactory. Blood pressure within normal limits. Abdomen extremely rigid.
Favorable**** Unfavorable .. ..
No operation Uneventful recovery

CASE 2. Kidney injury. Careful watching.
Favorable**** Unfavorable .. ..
No operation Uneventful recovery

CASE 3. Ruptured peptic ulcer. Seen three days later. Pneumo-peritoneum by x-ray.
Favorable**** Unfavorable .. ..
No operation Slow recovery

CASE 4. Thrombosed vein in right groin which was supposed to have been by injury. Strangulated epiphilocele was suggested. Thrombosed veins of the spermatic cord were removed.

Favorable*****	Unfavorable ..
Operation	Uneventful recovery

CASE 5. Female 16 year old. Horse back riding. Acute sudden severe pain lower right quadrant. Examination showed tenderness and rigidity over right quadrant. Operation revealed active arterial hemorrhage from right ovary.

Favorable	Unfavorable .. ..
Operation	Uneventful recovery

CASE 6. Female, 38 years old. Thrown to road from runaway wagon. Abdomen was run over by right hind wheel of wagon. Abdomen was extremely rigid. No evidence of shock and all laboratory work was essentially normal. Generalized abdominal rigidity receded in 7 days.

Favorable***	Unfavorable .. .. ..
No operation	Slow recovery

CASE 7. Male, 28 years old. Refused to give up small amount of money. Shot through abdomen with 22 caliber bullet. Generalized abdominal rigidity. Patient in profound shock. Blood pressure 90/40. Blood transfusion given. At operation, laceration liver was packed; an opening in the duodenum was closed; four small intestinal lesions were sutured by pursestring sutures. The opening in the colon was closed in a similar manner. Penrose cigarette drain to each of involved areas. Patient discharged in 28 days.

Favorable	Unfavorable .. ..
Operation	Satisfactory recovery

CASE 8. Female, 34 years old. Riding in rear seat of automobile which slid into ditch. X-ray examination showed fractured pelvis. Catheterization of bladder revealed definite rupture. Genito-urinary specialist operated and closed the ruptured bladder extraperitoneally. The patient died. Autopsy revealed a very large laceration of uterus, broad ligament from which she had hemorrhaged profusely.

Favorable	Unfavorable .. ..
Operation	Died

CASE 9. Patient injured when 4000 lb. tube rolled on him. X-ray showed multiple fractures of the pelvis. Flat x-ray plate of abdomen showed no air under the diaphragm. Diagnosis: retroperitoneal pelvic hematoma. Abdomen not opened.

Favorable***	Unfavorable .. .. ..
No operation	Uneventful recovery

CASE 10. Male, 24 years old. Compressed air nozzle to anus. Patient's abdomen opened and a huge rent was found in the sigmoid.

Favorable	Unfavorable .. ..
Operation	Died

CASE 11. Acute flexion during jump. Fracture of first and second lumbar vertebrae. Questionable intra-peritoneal hemorrhage. Abdomen was rigid for four days. Abdomen not opened.

Favorable***	Unfavorable .. .. ..
No operation	Uneventful recovery

Central States Society

—Twenty-First Annual Meeting—

THE CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY will hold its Twenty-First Annual Meeting at Peoria, Illinois, on May 21, 1940 — at the same time and place as the Centennial Anniversary Meeting of the Illinois State Medical Society, May 21, 22, and 23. The Program of the Scientific Meeting of the Central States Society, prepared under the supervision of DR. EDWARD C. HOLMBLAD, Program Chairman, is as follows:

Morning Session, May 21:

9:30—"Medicolegal Typing of Occupational Disease Cases" (with four illustrative case histories), by C. O. SAPPINGTON, M.D., DR.P.H.

ABSTRACT: The scientific evaluation of etiology, differential diagnosis, and disability furnishes the three variables used to type the medicolegal possibilities of occupational disease cases.

Etiology specifically involves the use of industrial hygiene procedures in the appraisal of employment exposures; differential diagnosis embraces the establishment of cause-and-effect relationships between the industrial environment and the physical and clinical laboratory findings; disability evaluation includes proving that disability is directly caused by an occupational disease.

10:00—Ten-Minute Reports, following by Round Table Discussions as to the Newer Developments and Present Status of the Following Industrial Problems:

"Physical Examinations," URBAN E. GEBHARD, M.D.
"Specific Loss Appraisals," V. S. CHENEY, M.D.
"Hernia," WILL LYON, M.D.
"Absenteeism," J. H. FINCH, M.D., and G. W. STABEN, M.D.
"Back Injuries," FRED W. SLOBE, M.D.
"Syphilis in Industry," PAUL PALMER, M.D.
"Economics of Industrial Medicine and Surgery," JAMES A. VALENTINE, M.D., and FRED M. MILLER, M.D.
General Open Forum Discussion.

Afternoon Session, May 21:

(Joint Meeting with Surgical Session, Illinois State Medical Society.)

2:00—"Wound Healing," MICHAEL MASON, M.D.
"Care of Infected Wounds," DAVID J. LEWIS, M.D.
"Postoperative Embolism and Thrombosis," GAZA DE TAKATS, M.D.
"Treatment of Compound Fractures," WM. R. CUBBINS, M.D., JAMES J. CALLAHAN, M.D., CARLO S. SCUDERI, M.D.

SYNOPSIS: Compound fractures in our clinics have been handled in the simplest possible manner. Cleansing and removal of hair and dirt around the edges of the wound; careful scrubbing and cleansing of the wound itself, with normal salt solution; complete and accurate debridement, with removal of all dead tissue and detached fragments. Loose closure. No washing of wound. Immobilization and, in leg compounds, with skeletal traction in os calcis.

"Treatment of Burns," CHESTER R. ZEISS, M.D.

SYNOPSIS: The prerequisite of any burn therapy should be to relieve pain, prevent excessive loss of body fluids, reduce absorption of toxins, hasten separation of dead tissues, prevent or minimize scar tissue formation, minimize surface infections, and promote and enhance healing.

The officers in charge of the meeting are HAROLD A. VONACHEN, M.D., President of the Society, FRANK P. HAMMOND, M.D., Secretary-Treasurer, and DAVID W. FEY, of Peoria, Chairman, Local Arrangements Committee.

The American Associations

FOLLOWING is the Program of the four-day joint meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, to be held at Hotel Pennsylvania, New York City, June 4, 5, 6, and 7, 1940.

This meeting comprises the Twenty-Fifth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and the First Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION.

American Industrial Hygiene Association

FIRST ANNUAL MEETING

Monday Afternoon, June 3: 3:00 to 5:00 P.M.

Registration.

Tuesday Morning, June 4: 9:30 A.M.

WILLIAM P. YANT, *President, American Industrial Hygiene Association, Chairman of Session:*

Address of Welcome: HONORABLE FIORELLO LAGUARDIA, Mayor, City of New York.

Response: McIVER WOODY, M.D., President, American Association of Industrial Physicians and Surgeons.

"Industrial Hygiene in Steel Plant Practice." DONALD H. CUMMINGS, Director, Division of Industrial Hygiene, University of Colorado Department of Medicine, Denver, Colorado.

"A Preliminary Report of the Effects of Exposure to Dust in the Chrome Brick Industry." W. B. FULTON, F. E. BUTTERS, A. E. GALLOWAY, F. P. KOPPENHAVER, K. R. DOREMUS and R. M. KIRK, Division of Industrial Hygiene, Pennsylvania Department of Health Harrisburg, Pennsylvania.

• "Exposure to Mercury in the Manufacture of Felt Hats." HERVEY B. ELKINS, Chief Chemist, Division of Occupational Hygiene, Massachusetts Department of Labor and Industry, Boston, Massachusetts.

"Exposures to Fume and Noxious Gases under Varied Conditions of Arc Welding using Uncoated Washed Rods." G. C. HARROLD, S. F. MEEK and C. P. McCORD, Industrial Hygiene Laboratories, Chrysler Corporation.

Tuesday Afternoon, June 4: 1:30 P.M.

"Toxicity of Converted Films of Urea-Formaldehyde-Ethylene Glycol Resins when Taken Orally." T. S. HODGINS and A. G. HOVEY, Reichold Chemicals Inc., Detroit, Michigan.

"Field Determinations of Carbon Bisulfide in Air." F. J. VILES, Chemist Research Laboratory, Liberty Mutual Insurance Company, Boston, Massachusetts.

"Comparison of Gas Recorders vs Routine Sampling for Carbon Bisulfide and Hydrogen Sulfide in Air." G. M. REECE and P. DRINKER, Department of Industrial Hygiene, Harvard School of Public Health, Boston, Massachusetts.

"Dropping Mercury Electrodes for Lead Analysis."

"Application to Lead in Air." E. C. BARNES, Industrial Engineer Medical Department Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania.

"Application to Lead in Urine." H. CRANSTON, M.D., Chicago, Illinois.

"Estimation of Small Amounts of Antimony Using Rhodamine B." W. G. FREDRICK, Chief Chemist, Detroit Bureau of Industrial Hygiene, Detroit, Michigan.

"A Rapid Photometric Method for Determining Micro Quantities of Solvent Vapors in Air." W. F. HANSON, R. & H. Chemicals Department, E. I. duPont de Nemours & Company, Niagara Falls, New York.

Tuesday Evening, June 4: Dinner Meeting.

"Light and Life — Some Glimpses into the Future." SAMUEL G. HIBBEN, Director of Applied Lighting, Lamp Division, Westinghouse Electric & Manufacturing Company, Bloomfield, New Jersey.

"Industrial Quieting and Its Advantages." L. S. AYRES, JR., Assistant Manager, Acoustical Department, Celotex Corporation, New York, New York.

Wednesday Morning, June 5: 9:00 A.M.

"Studies of the Lead Hazard in Printing."

"Engineering and Chemical Phases." H. W. RUF, Industrial Hygiene Unit, Wisconsin State Board of Health, Madison, Wisconsin.

"Medical Phases." E. L. BELKNAP, M.D., Medical Consultant, Milwaukee, Wisconsin.

"Lead Exposures as Estimated by Urinary Excretion and Effect of Vitamin C on Exposed Workers." S. W. MARCHMONT ROBINSON, M.D., Department of Industrial Sanitation, Ford Motor Company.

"Control of Possible Lead Hazards in the Production and Use of Leaded Steels." EDWIN D. MARTIN, Metallurgist, Inland Steel Company, Indiana Harbor, Indiana.

"Correlation Coefficient Between Basophilic Aggregation Test and Lead in Urine." G. C. HARROLD and S. F. MEEK, Industrial Hygiene Laboratories, Chrysler Corporation, Detroit, Michigan.

"The Significance of Clothing in Air Conditioning Standards." C. P. YAGLOU, Department of Industrial Hygiene, Harvard School of Public Health, Boston, Massachusetts.

"The Effects off Humid Heat on Colored and on White Workers." D. B. DILL, Professor of Industrial Physiology, Fatigue Laboratory, Harvard University, Boston, Massachusetts.

"Economy in Exhaust System Design." T. HATCH, Associate Dust Control Engineer, Division of Industrial Hygiene, New York State Department of Labor, New York, New York.

Wednesday Afternoon, June 5: 1:30 P.M.

"Animal Studies on the Toxicity of Antimony." WM. R. BRADLEY, Bureau of Industrial Hygiene, Detroit Department of Health, Detroit, Michigan.

"The Excretion of Carbon Bisulfide after Breathing Low Concentrations." P. DRINKER and G. M. REECE, Department of Industrial Hygiene, Harvard School of Public Health, Boston, Massachusetts.

"Absorption, Distribution and Elimination of Benzene from Body Tissues and Fluids of Dogs Exposed to Benzene Vapor in Air." H. H. SCHRENK, Chief Chemist, Health Section, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pennsylvania.

"The Toxicity of Nitroparaffins and Their Derivatives." WILLARD MACHLE, Assistant Director, Kettering Laboratory of Applied Physiology, University of Cincinnati, College of Medicine, Cincinnati, Ohio.

"The Response of Rabbit Skin to Compounds Reported to have Caused Acne-Form Dermatitis." E. M. ADAMS, D. D. IRISH, H. C. SPENCER and V. K. ROWE, Biochemical Research Laboratory, Dow Chemical Company, Midland, Michigan.

Business Meeting: 4:30 P.M.

American Association of Industrial Physicians and Surgeons

TWENTY-FIFTH ANNUAL MEETING

Thursday, June 6

9:00—Business, Committee Reports, etc.

9:30—President's Address—McIVER WOODY, M.D., President, American Association of Industrial Physicians and Surgeons.

9:50—"Pre-Employment Physical Examination"—HARRY A. NELSON, M.D. Discussion, J. J. WITTMER, M.D.

10:30—"Care and Handling of Traumatic Injuries"—JOHN J. MOORHEAD, M.D. Discussion, H. V. SPAULDING, M.D.

11:15—"Back Injuries"—J. HUBER WAGNER, M.D. Discussion.

12:15—Round Table Luncheons, separately held, on the following subjects:
"New Drug Therapy"—J. M. CARLISLE, M.D., Medical Director, Merck & Co.
"Toxicology in Industrial Medicine"—J. H. FOULGER, M.D., Director, Haskell Laboratory of Industrial Hygiene.
"Who Can Work: Evaluation of Physical Fitness

for the Job"—MICHAEL LAKE, M.D., Medical Director, R. H. Macy & Co.

2:00—"Problems in Diagnosis and Management of the Nucleus Pulposis"—BYRON STOOKEY, M.D. Discussion, JEFFERSON BROWDER, M.D.

2:40—"Injuries Involving the Elbow Joint"—PHILIP D. WILSON, M.D. Discussion, JOSEPH L'EPISCOPO, M.D.

3:20—(Subject to be announced)—WM. DARRACH, M.D. Discussion, CLAY RAY MURRAY, M.D.

8:00—Twenty-Fifth Annual Dinner.

Friday, June 7

9:30—"Diagnostic Criteria in Lead Poisoning"—ELSTON L. BELKNAP, M.D. Discussion, IRVING GRAY, M.D.

10:15—"Hygiene Aspects of Welding in the U. S. Navy"—Discussion, EMERICH VON HOAM, M.D., Ohio State University.

10:45—"Occupational Dermatitis"—MARION SULZBERGER, M.D. Discussion, H. J. SCHWARTZ, M.D.

11:30—"Silicosis"—L. E. HAMLIN, M.D. Discussion, LEROY U. GARDNER, M.D.

12:15—(Subject to be announced.)

2:00—Call to Order; Reports of Committees, etc.

—"Effort and Trauma in Coronary Occlusion and Insufficiency"—ARTHUR M. MASTERS, M.D. Discussion.

2:50—"Trauma and the Peripheral Vascular System"—IRVING WRIGHT, M.D. Discussion, GILBERT MARQUARDT, M.D., Chief, Vascular Clinic, Northwestern University Medical School.

3:30—"Shock"—JOHN SCUDDER, M.D. Discussion.

—Summation—CASSIUS H. WATSON, M.D.

[See page 284 for Program of Social Activities.]

Industrial Medicine and Industrial Hygiene

KENNETH E. MARKUSON, M.D., C.P.H.,
Director, Bureau of Industrial Hygiene, Michigan Department of Health and Detroit Department of Health

ALTHOUGH Dorland's Medical Dictionary defines hygiene as "the science of health and its preservation," I do not believe that the term industrial hygiene is as appropriate as the term industrial health. Many of us associate the word hygiene with sanitation and therefore when we speak of industrial hygiene, immediately we think of plant sanitation, forgetting the general health problems of the individual workers.

Industrial health is that phase of medicine dealing with the preservation of the health of the worker. As such, is embraces a very large field covering not only occupational diseases and accidents but is also vitally concerned with all the factors having an influence on the general health of the worker, including plant sanitation, lighting, ventilation, communicable disease, venereal disease and all the chronic degenerative diseases of adult life.

There is little doubt but that a close relationship exists between the life span of an individual and his occupation. Louis Dublin, of the Metropolitan Life Insurance Company, conducted a study in 1929 covering over 3,000,000 deaths from which he concluded that the life span of the industrial worker is seven years less than that of the non-industrial worker. Although great progress has been made in lowering our death rate during the past few years, we must admit that this decrease has resulted from decreased death rates in the infant, childhood and young adult groups. While these death rates have been decreasing there has been a decided increase in the death rates from several of the diseases associated with adult life. In view of these facts there is much to be learned relative to the early cause of death and increased incidence rates of the various diseases affecting the general adult population and the industrial worker in particular.

Studies such as these have been the basis for the extreme interest shown by the medical profession, public health agencies and industry toward the problem of industrial health. Likewise, they have served to stimulate these various groups to set up the necessary mechanism for further study in this field throughout the United States. Prior to 1936 only three states maintained industrial hygiene bureaus; at the present time there are 26 state and several city bureaus. In addition the American Medical Association, several state and local medical societies have created committees on industrial health. Many of our larger industries have established notable preventive medical services for their employees and are to be highly commended for the efficient service being rendered. The big problem, however, is not associated with the large plant. Numerically speaking they employ only a very small percentage of the workers employed in industry.

Fifteen million of the 50,000,000 gainfully employed persons in the United States are employed in the manufacturing, mechanical and mining industries where the more harmful health exposures occur. Of this number less than 2% are employed in plants having over 1,000 workers; 62% are employed in plants having less than 500 workers and a large percentage work in plants having less than 50 employees. The majority of these workers at the present time go without any degree of preventive medical service as the cost of furnishing such care in the small plant is extremely high. The cost per capita of providing a full time service to plants having 500 employees is approximately double that for plants having 1,000 employees and the ratio is even greater for the smaller plants.

The small employer then must rely upon the services of a governmental agency for technical assistance if his workers are to be given the necessary protection against occupational exposures. This does not mean that the governmental agency should undertake the entire preventive medical program. Medical examinations and therapy should not be done by the health department if the proper relationship is to exist between the patient, the physician and the department.

The services afforded by the official agency should in no way interfere with the domain of the private physician. In fact, such a comprehensive

Presented at the Annual Meeting of the Michigan Association of Industrial Physicians and Surgeons, Grand Rapids, Michigan, April 17, 1940.

program should stimulate a larger practice for him. The public health unit should act merely as a case finding agency and the curative phases of medicine should be referred to the private physician. Public health should be limited to preventive, not curative medicine except in those instances where treatment can be had in no other way. Since industrial hygiene deals only with those individuals who are gainfully employed these people are in a position to pay for medical care and, therefore, the private physician should benefit through such a program. Exceptions to this must be made in those cases where the employee is suffering from an occupational disease resulting from a specific industrial exposure, when, of course, the employer is responsible for the necessary medical attention.

We know from various published statistics that over 10 times as much disability arises in industry from the ordinary diseases incident to adult life than from the purely occupational diseases and injuries. The time lost as a result of the occupational diseases is decreasing each year because the occupational exposures and hazards are being better controlled. Industry is constantly improving working conditions in order to bring about a better relationship between employer and employee and also to improve production methods. The average age of the industrial worker is increasing and with this increase in age the disability arising from the chronic degenerative diseases, such as heart and blood vessel disease, nephritis, etc., is correspondingly on the increase. Contrary to general opinion industry is reluctant to discharge capable, well trained employees merely because they are growing old. They know that the value of the experience gained through years of work cannot be replaced by youth and they are also aware of the fact that the cost of training new employees for responsible positions is far greater than the added expense of keeping old employees. Then too, many employees whether capable or not continue to hold their positions through seniority rights.

Physician's Part in the Program

WERE the industrial health program merely a matter of the prevention of occupational diseases it would be a simple matter as a large majority of these could be prevented by engineering methods such as substitution, exhaust ventilation or other mechanical means of preventing further exposure to toxic substances. As previously stated, however, the greatest problem is in the control of the non-occupational diseases.

Since we are mainly concerned with the small plant which is unable to provide the services of a full time medical man or an industrial hygienist, the majority of this work falls on the part time or private physician. Here he has an excellent opportunity to develop a comprehensive industrial health program for the industries with which he is associated. The physician should not be content merely to treat injuries and diseases, but he should acquaint himself with the materials used in the plant and the processes of manufacture in order to determine the use of toxic materials and the extent of exposure. By so doing he may be able to associate his findings and the symptoms with the patient's occupation. For instance, he may have a patient or several patients complaining of headaches, dizziness, nausea, irritability, etc., for which he can find no apparent cause. Were the physician to make an inspection of the work places he may find that these patients were exposed to the fumes of trichlorethylene or carbon tetrachloride from an uncontrolled degreasing operation. Should such exposure continue over a period of time there may be extensive damage and perhaps even death. This is merely one of several examples that may prove the value of becoming familiar with plant practices. He may find similar exposures to lead dust or fumes and when such exposures have been properly controlled through engineering methods the resulting diseases will disappear.

Medical Examinations

MEDICAL examinations, as in any preventive medical program, are the basis of the control program in industrial health. Pre-employment and periodic examinations are the instruments that must be used to decrease the incidence of all diseases whether occupational or non-occupational and it is here that the physician can prove of the utmost value. These examinations must be thorough or they will defeat their ultimate purpose. They should not be used as a weapon to prevent employment, but should be used as means of properly placing each applicant in a suitable occupation and for the early diagnosis of illness. Industry should bear in mind that the physical examination is only part of its responsibility as it should be obligated to furnish these men with safe work places, free from harmful exposures, after choosing them on their health merits. This is also the responsibility of the physician as it is he who must decide upon the health status of each employee and then see that he is provided with adequate protection against harmful health exposures. To carry out the second condition the physician must know the toxic substances used in production and the concentration to which each worker is exposed. If he needs help in determining the concentration the bureau of industrial hygiene can furnish him with necessary assistance and make recommendations for the installation of proper control methods. In addition to pre-employment examinations the employee should be examined periodically, especially those who are exposed to harmful substances. The interval of these examinations should depend upon the physical condition of the workers and the severity and duration of their exposures. In some instances it may be well to examine every two or three months and in others a year or two may be a safe interval. This, however, is a matter for the attending physician to decide.

Services Available

IT IS recognized that the small employer cannot provide a satisfactory industrial hygiene serv-

ice because of the cost. Since this service is of vital importance it is incumbent on a governmental agency to furnish it. This agency in Michigan is the Bureau of Industrial Hygiene and its services are available without cost to any firm or physician in the state. All that is necessary to obtain such assistance is to make a request to the State Bureau of Industrial Hygiene or to any of the local bureaus of industrial hygiene which are located in the health departments of Detroit, Grand Rapids, Flint and Saginaw.

The technical work in any industrial hygiene program is highly specialized and requires a wide variety of costly equipment which can be furnished by the Industrial Hygiene Bureau.

The services available to physicians and industrial concerns are as follows:

1. The Bureau of Industrial Hygiene has the necessary personnel and equipment to make detailed plant studies to determine specific quantitative exposures to dusts, fumes, vapors, mists and gases in workroom atmosphere.

2. The trained personnel of the Bureau provides assistance to industry in the design of ventilation equipment for preventing unnecessary exposure to harmful materials.

3. The Bureau may be used as a consulting agency by physicians or industrial concerns in problems pertaining to industrial health.

4. The laboratory facilities of the Bureau are at the disposal of physicians or industry in determining health exposures.

5. Through its familiarity with new industrial materials and processes, the Bureau is able to furnish information relative to their toxicities and use prior to their introduction in plants.

6. Through its close check on the reporting of occupational diseases the Bureau is able to assist industry in the elimination of the specific exposures causing such diseases before fellow workers are similarly affected.

7. The Bureau acts as a distributor of information on industrial hygiene through its rather complete reprint file of current literature.

Industry and its workers are becoming more and more health conscious. The workers are demanding health protection, and industry realizes that good health among its employees is one of its greatest assets. It increases production, decreases compensation costs and promotes better relationship between employer and employee. For confirmation of this we have only to note that several of our large industries are spending several million dollars yearly to promote better health among their workers. Due to financial circumstances the small employer will be the last to react, but he will in time and when he does, the medical profession and especially the private practitioner should be ready to accept his responsibilities, as the small plant must rely upon him.

The Problem of the Sanitary Engineer

WHILE the engineer does have an important part in any industrial health program, sanitation is only one of his many roles. Therefore, it seems preferable to classify him as an industrial hygiene engineer. He has such a multiplicity of duties and his training is so varied that he can be claimed by none of the well established engineering groups. In other words he is more or less of a maverick, unclaimed and unbranded. He must have a good background of mechanical, chemical and sanitary engineering with a smattering of knowledge of ventilation engineering. He should have some conception of the medical field in order that he may correlate his engineering results with the findings of the physician.

Technique and Results of Surveys

INDUSTRIAL hygiene surveys no doubt resulted from the extensive lack of knowledge of the subject on the part of public health officials and the medical profession. A few years ago when the public became industrial health conscious as a result of the efforts of Dr. R. R. Sayers of the United States Public Health Service, and due to the fact that many states had passed compensation laws, industry became greatly interested. The demand for trained personnel was enormous and none were to be found. The extent and severity of the problems were not known and in order to determine these and to develop trained individuals for the field of industrial hygiene surveys were inaugurated. They serve three purposes: as a training unit for future personnel, to determine the extent of the problems in any given area and as a means of acquainting industry with the services that are available to them through the industrial hygiene bureaus.

The preliminary survey merely indicates where further work is necessary and if not followed up by a detailed study consisting of sampling for various toxic substances to determine the actual severity of worker exposure their value is greatly reduced.

The Control of Occupational Diseases

THE medical man and the engineer play an equally important role in the control of occupational diseases. The essential features of a medical control program have been discussed previously in this paper so mere mention of them should be sufficient at this point.

1. Pre-employment and periodic medical examinations.

2. Determination of toxic materials to which workers are exposed.

3. Reduction of lost time due to illness.

4. Proper placement of workers.

5. Education of the employer and employee as to the value of good health.

In order to institute engineering control measures for the protection of the worker certain prerequisites are necessary. It is first necessary to locate the hazardous operation, determine the nature and extent of the exposure, present methods of control and the number of workers exposed. Secondly, a physician should determine the extent to which these exposures have affected and are affecting the health of the workers. Equipment should be available to determine dust concentration or the quantity of other air contami-

nants. Persons should also be available who are well versed in the design, installation and maintenance of hoods, exhaust systems and other control mechanisms.

Engineering control of occupational disease is of vast importance and can be obtained through several different methods.

1. The substitution of non-toxic materials for toxic materials has been used extensively in the foundry and machine industries. Many foundries are now using non-silica parting in preference to silica parting and steel shot or grit has been substituted for sand in many sandblasting operations. These changes have been responsible in decreasing the incidence of silicosis in these industries.

2. The isolation or mechanical enclosure of certain harmful processes has been of much value in many instances. This method of control has been used extensively in degreasing operations where toxic vapors enter the breathing zone of the workers. Such operations can be isolated to the extent that only the operator is exposed and not the other workers in the adjacent area. Such operators are then protected by local or general ventilation or by the use of respiratory equipment. Sand-blasting operations have also been completely enclosed in many plants so that no one is exposed to silica dust.

3. Wet methods of control have proved of great value in the control of dust in mining and quarrying operations. These methods consist of the introduction of water, usually in the form of a spray, at the source of dust production, resulting in the wetting and settling out of large quantities of dust which would normally be expelled into the workroom atmosphere. Water spray curtains are sometimes set up in mine tunnels to confine the dust to small areas. It has been possible, through this method, to decrease dust counts from 500 million to 30 million particles per cubic foot of air.

4. When controlling any harmful exposures by ventilation, the application of local exhaust ventilation is usually worthy of first consideration. In this type of ventilation, dusts, fumes, vapors, mists or gases are removed from the workroom air at the point of origin, thus eliminating the possibility of excessive worker exposure.

5. Occasionally it is not practical and at times not effective to apply local exhaust ventilation, and in these instances respirators are required. It should be remembered, however, that respirators should be used only as a last resort when other methods cannot be used satisfactorily.

6. Protective ointments have proved of benefit in decreasing the incidence of industrial dermatitis and many such preparations can now be obtained. These ointments are designed to give a protective coating to the exposed skin, and at the same time be impervious to the irritating material.

In connection with all hygienic exposures it is necessary to make frequent engineering checks on control equipment and also in some cases to make frequent medical examinations of the men involved in these exposures. Proper maintenance of control equipment in connection with any process is very important since failure of such equipment may cause excessive exposures resulting in permanent damage to the health of the workers.

In addition to his more specific duties the sanitary engineer can assist materially in providing a safe water supply for human consumption and this indeed is a vital problem as many industrial plants have a dual water system—one a cheap unprotected supply for production purposes and fire protection and one for human use. In such cases it is essential that there are no cross connections, and in many instances only trained individuals are able to trace these hazards.

Educational Program

TO ASSIST in the promotional phases in the program of industrial health the Michigan State Medical Society has recently organized a Committee on Industrial Health, the Chairman of which is Dr. Henry Cook, of Flint. This Committee has been extremely active in instituting educational programs in the various local medical societies and has also been instrumental in promoting the cooperation of the Postgraduate Medical Education Department of the University of Michigan. The Extra-Mural Conferences organized by the Postgraduate Department and the Michigan State Medical Society are devoting a portion of the eight regional April meetings to industrial health. In addition, the local medical societies in Detroit, Grand Rapids, Flint and Saginaw, (these cities have local industrial hygiene bureaus) have created Committees on Industrial Health and are cooperating with physicians and health departments in the local program.

Medical schools throughout the country should take a more active part in the proper training of their students relative to the health problems of the industrial population. Such training has been sadly neglected and in only one or two instances can it be obtained in any of the public health schools. Why shouldn't the medical student be taught the value of a complete occupational history? The information obtained from it is oftttimes of more importance and may have a more direct bearing on the case than his personal and family history and what would the chief of staff say if the latter items were not included on every hospital case under his supervision?

In this paper I have attempted to present the various phases of industrial hygiene, not limiting it to the occupational diseases, and I trust that I have conveyed the idea to you that industrial hygiene is a problem for the medical profession and the general public health worker as well as the industrial hygienist. Much of the technical work is highly specialized, but we must not forget that the industrial worker is also exposed to all the hazards of the adult population and as such should come under the jurisdiction of a generalized adult health program. For that reason industrial hygiene should be closely integrated with all other available community health agencies if we expect to decrease the incidence of both the occupational and the non-occupational diseases occurring in the industrial group.

Chronic Bone Infections

Edward Thomas Newell, M.D., F.A.C.S.,
Chattanooga, Tennessee

THE diagnosis of bone pathology clinically and roentgenologically is often intricate and difficult. The treatment of bone pathology is quite often unsatisfactory.

There are few medical and surgical problems that require so close cooperation of the bone surgeon and radiologist as does the diagnosis and proper treatment of bone lesions.

The scope of this paper is limited to chronic bone infections. The acute inflammatory conditions and neoplasms are purposely excluded.

Chronic bone infections are usually of seven types:

1. Pyogenic osteomyelitis.
2. Tubercular osteomyelitis.
3. Chronic sclerosing osteomyelitis (osteitis) Garre's.
4. Lues — periostitis — gumma — Charcot's joint.
5. Brodie's abscess.
6. Paget's disease. Osteitis deformans.
7. Echinococcus cysts (Not usually found in America).

The most common conditions the railway surgeon encounters in inflammatory bone pathology are pyogenic osteomyelitis, acute and chronic — tubercular osteomyelitis — luetic bone pathology.

Chronic Osteomyelitis often follows compound fractures, but most often is hematogenous in character and is usually confined to the long bones — femur — tibia — humerus — radius — etc., but it can and does effect any of the bones of the body. Osteomyelitis can be produced by almost any of the usual pyogenic organisms, but is most frequently caused by the staphylococcus, and usually aureus.

The hematogenous variety usually affects the diaphysis near the epiphysis, may spread through the medullary canal thence to the cancellous tissue, cortical surface, subcutaneous tissues, and finally the integuments, with sinus formation. Osteomyelitis seldom crosses the epiphysis, which seems to act as a barrier and encroaches upon the osseous tissue in the opposite direction.

Acute infectious osteomyelitis is a catastrophic malady usually occurring before puberty, and requires immediate, specific and radical treatment to save life and limb. Alton Ochsner and Howard Mahorner, of New Orleans, believe it best to wait in some cases until the extreme toxicity has passed before operative interference.

Chronic osteomyelitis, with which we are especially interested, does not require the immediate treatment outlined above, but it is mandatory that the treatment be radical, complete, and carried out along specific lines. A quarter of a century ago, the treatment of chronic osteomyelitis was — wide incision — curettage — followed by irrigation with the well-known antiseptics of that period — bichloride, phenol, etc.

Later, about 1914, during the World War period, the Carrel-Dakin Method became the accepted procedure in treatment. Wide debridement of the involved soft tissues with guttering of the involved bone, together with thorough removal of all dead bone and the application of two or three Dakin tubes, increased very materially the percentage of cures in these previously hopeless chronic cases.

A few years later, about 1920, Dr. T. G. Orr, of Kansas City, gave to the profession what is now known as the "Orr Treatment for Osteomyelitis." This is the best, simplest, cheapest, and most effective treatment at the present time. Briefly, the treatment consists of wide dissection of the diseased area with the scalpel, with complete removal of all dead and diseased bone with chisel or rongeur; packing the cavity made in the bone and the opening in the soft parts with vaseline gauze, keeping the soft parts and the integument widely separated, until the entire area — bone, soft parts, and skin — has healed from the medullary canal to the skin with granulation tissue.

The wound and extremity are encased in plaster cast. The cast is not changed for several weeks following the original application, in spite of the terrible odor that develops, the pus which comes away from the depth of the wound, which soaks into the cast and often runs out above or below it, depending upon the posture of the limb.

The patient soon becomes accustomed to the odor and does not notice it, but the doctors, nurses, and visitors are very cognizant of the penetrating pungent odor upon entering the patient's room. Those who have *not* tried this unusual and efficient treatment may be quite skeptical of the appropriateness of its application, but those who *have* used it, in quite a series of cases, commend its simplicity and effectiveness.

It may be well in addition to the above to give the patient sulphanilamide although it does not have the specific effect in the usual case of osteomyelitis that it does in many other infectious conditions. Case report later.

The late Dr. Bear, of Johns Hopkins, reported at the Meeting of the Southern Medical Association, Surgical Section, in Ashville, N. C., some 10 years ago the use of maggots in the treatment of chronic osteomyelitis. It was my pleasure to be present and hear this initial report of his success in the use of maggots in the treatment of osteomyelitis. Dr. Bear's report was received with "absolute silence" following his detailed description of the use of sterile maggots in this stubborn condition. No one discussed his illuminating report. Yet it was not long before many surgeons throughout this and other countries verified Dr. Bear's report as to the curability of chronic osteomyelitis with maggots, held in captivity by wire mesh, over a period of several weeks.

The treatment of today may be summed up as follows: Wide excision of all diseased tissue — soft and bony — guttering of the bone, and either

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the application of Dakin tubes or the application of the Orr method or the maggot treatment. Each case must be individualized and appropriately treated.

TUBERCULAR OSTEOMYELITIS is a chronic condition which develops on the epiphyseal side of the bone next to the joint, usually involving the joint, and affects long, short, and irregular bones. It is encountered much less frequently than chronic pyogenic osteomyelitis and is much less amenable to treatment. These patients are usually weak, emaciated, running temperature in afternoon, and usually have a focus of infection somewhere else in the body. The treatment is local and systemic.

Tubercular osteomyelitis as well as chronic osteomyelitis is not an infrequent cause of fracture of diseased bones and your attention may first be called to the tubercular osteomyelitis, by one seeking treatment for a fracture. The most frequent site is the spine.

CHRONIC SCLEROSING OSTEOMYELITIS (Osteitis) (Garre's disease) is a very rare condition and usually involves the long bone following an injury to the soft parts and periosteum which extends to the cortical and cancellous structure of the bone. In contra-distinction to osteomyelitis, it usually spreads to the bones via the lymphatics. The x-ray pictures are very definite and the treatment should be radical, is usually very effective, and does not require the use of the Orr method or Dakinization. I shall later report a case which typifies this condition.

Fig. 1. Case 1.
Chronic osteomyelitis of 12 years duration

LUES not infrequently involves the bony structure of the body. Syphilis most frequently involves *first* the periosteum, and this may require multiple incisions along with vigorous anti-syphilitic treatment for recovery, which in itself is diagnostic.

GUMMA of the bone, Charcot's joint, and other chronic lesions are often seen in the wake of chronic lues. The x-ray pictures of bone syphilis is characteristic as well as that of Charcot's joint, but bone syphilis can simulate almost any bone neoplasm, just as syphilitic skin lesions may simulate other skin diseases. The treatment of the gumma is much simpler than that of Charcot's joint, but both require intensive anti-syphilitic treatment. The Charcot's joint, if neglected for a long time, will be permanent and will necessitate the use of some form of support, but in the earlier cases, remarkable success can be obtained by properly administered anti-luetic treatment, over a long period. The history of the case and Wassermann reaction are of greater importance in the diagnosis, than are the x-ray films. Report of cases.

BRODIE'S ABSCESS is a circumscribed bone abscess situated in the cancellous tissues of the extremity of a long bone. Most of these cases are found in the tuberosity of the tibia. There is definite pain, swelling, heat, redness, fever, with leukocytosis and more or less disability of the affected limb. The history of a long-standing condition and the x-ray films usually confirm the diagnosis.

Fig. 1. Case 7.
Showing rarefied area (Brodie's abscess) in proximal end of tibia

The treatment consists of free incision, thorough curettement of the diseased bone, iodoform gauze packing, and the usual antiseptic dressing until the area in the bone has filled in. Occasionally, it may be necessary to fill the cavity with bone chips, but this is seldom necessary. Case report will be presented later.

PAGET'S DISEASE is a chronic inflammatory disease usually of the long bones — the tibia — but may involve many bones of the body. It reveals a very characteristic picture in the x-ray and is known as osteitis deformans. Paget's disease may be mistaken for other bone conditions, but it is a separate entity.

We have found two cases of Paget's disease in x-raying more than 12,000 fracture cases. Time does not permit to report same.

ECHINOCOCCUS CYSTS are usually included in the chronic inflammatory bone disease. In our clinic, we have had many bone cysts — simple cyst — giant cell tumors — Ewing's tumor, etc., but we have not seen an echinococcus cyst in any of our radiograms taken for bone pathology. The echinococcus cyst is due to the specific organism — echinococcus — and is found most frequently in Central and South America.

Case Reports

CASE No. 1. OSTEOMYELITIS.

Miss G.C., white American, age 25, Tennessee, came to the Sanitarium on Novembes 11, 1938, with a discharging sinus from the lower and inner third of the right leg which she states had been discharging for the past 12 years. She gave a typical history of osteomyelitis, the casting off of sequestrae, of having been unsuccessfully operated upon following the acute condition, and that she had been treated by many doctors with many antiseptic solutions during this period.

The x-rays reveal the right femur to be more than twice the normal size in the A. P. and lateral views, in the lower three-fourths, with sinus involvement. (Fig. 1.)

The patient was told that only a very radical operation would effect a cure. On December 30, 1938, under nitrous oxide ether anesthesia, an incision eight inches in length was made, the femur was exposed, the bone sinus located, and a wedge-shaped piece of the inner one-half of the femur, four inches long, was removed along with several sequestrae and all of the diseased bone. The guttered medullary canal, and the tissue were thoroughly cleaned with ether, tightly packed with vaseline gauze, cotton applied, bandaged, and a plaster of Paris cast was applied to the leg well above and below the incision.

The patient remained in the hospital a month without being dressed and without any pain, fever, or discomfort to speak of. At the end of this time, the cast and the packing were removed, a new vaseline gauze packing was applied maintaining wide separation of the tissues. No irrigation or antiseptic of any kind was used at any time. Miss C. returned every three weeks for removal of packing and renewal of cast for four additional months, at which time the wound had completely healed with scar formation, but no loss of function. The patient was dismissed at the end of five months and returned to her usual work in a hosiery mill and works eight hours a day on her feet without return of trouble.

CASE No. 2. OSTEOMYELITIS.

Miss E.C., white American, age 14, Alabama, came to the Sanitarium on June 8, 1933, with multiple osteomyelitis lesions of the long bones. Her original trouble was in the right hip and right ankle, but later she developed lesions in the left fibula and humerus.

She states that her trouble began on March 5, 1933, giving a history of having jumped off a rock and hurt her hip. Her physician treated her for six weeks for rheumatism and later the doctor said she had tuberculosis of the hip. Two months before she consulted me, and one month after the injury, she developed a "running sore" of the right hip.

The right leg was found to be about three inches shorter than the left. The x-rays revealed a pathological fracture of the right hip with dislocations of the head of the femur. She was placed in traction trusting the trochanter could be pulled down opposite the acetabulum. The patient was told that the head of the femur would probably have to be surgically removed at some later date; when the inflammatory condition had subsided.

This child had a very high leukocyte count and a very

Fig. 2. Case 1.
Showing femur after saucerization preparatory to Orr treatment.

Fig. 2. Case 7.
Showing iodoform gauze in abscess area that had been thoroughly curetted

low red cell count. She was weak, emaciated, undernourished, had high fever, rapid pulse, flushed cheeks, and was in serious condition — looked tubercular.

Little Miss C. was treated over a period of two years at the clinic and at her home — administering sun-ray treatment, forced feeding, tonics, etc. The sinus was irrigated with Dakin solution at home by her mother, three or four times daily. She would make trips to the Sanitarium for inspection every three or four months and renewal of the adhesive plaster for the Thomas splint. On January 5, 1935, the head of the femur was extruded at her home on Sand Mountain. I am presenting same to you. The wound following the discharged head of femur, closed, and when last seen in 1937, all of her sinuses had healed and she was gaining in weight and

Fig. 3. Case 1.
Showing incision healed four months after initial Orr treatment

strength. She now walks with the use of a stick and has a decided limp, as a result of bone shortening.

The patient returned 6-8-39, six years since date she originally presented herself. She looks well, walks around the house without any support, but has a small sinus in the lower one-half of tibia that drains occasionally.

Case No. 3. Osteomyelitis.

Miss B.C., white American, Tennessee, age 5, brought to Sanitarium with history that her illness began July 29, 1932, with pain in the left knee for one month. She was treated by her family physician with local application, heat therapy, etc. One month later was taken to Nashville where she had two operations for osteomyelitis, three weeks apart, without success.

The patient was brought to our Sanitarium on November 23, 1932, the lower end of the femur was protruding through the lateral aspect of the tissue in the lower one-third of the leg, the result of a pathological fracture. X-rays revealed three inches shortening. Pathological fractures in chronic osteomyelitis and bone cysts are not of infrequent occurrence.

Patient was operated upon, all dead bone removed, bone sutured, and two Dakin tubes applied. At the end of six weeks following Dakinization, patient was dismissed with leg in a cast and returned to her home. She returned six months later with a draining sinus which was curetted, further Dakinization was instituted. She made a very satisfactory recovery with two-inch shortening — due to loss of bone.

Case No. 4. Chronic Sclerosing Osteomyelitis (Osteitis).

Master V. McC., white American, Alabama, age 13, came to the Sanitarium on March 27, 1939, with a large ulcer on the inner and lower aspect of left leg which he claims has been present since Thanksgiving, 1938, and which had refused to heal by the ordinary method of treatment. He stated that he had a blow over his shin at this time and several days later had chills and fever. His local doctor incised the area and recovered some pus and blood, but was unable to produce healing of the wound.

The urinalysis and blood Wassermann were negative. The x-rays revealed a chronic sclerosing osteomyelitis (osteitis). The entire diseased bone area together with ulcer of the integuments and soft parts were removed en masse. The pathological section showed hypertrophy of the epithelium, ulceration, with much infiltration of

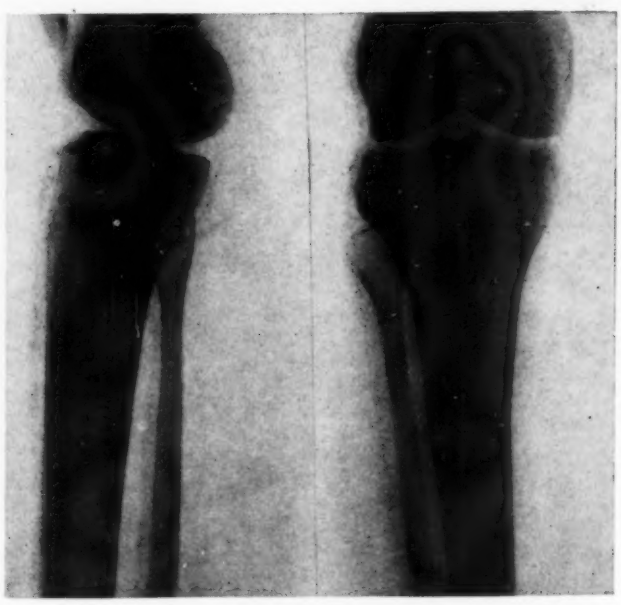

Fig. 3. Case 7.
Seven years later no roentgenological or clinical evidence of old trouble

subcutaneous and muscle tissue, with leukocytes.

The patient has made an uninterrupted recovery and at this time has been back in school for the past six weeks.

Case No. 5. Lues. Charcot's Joint:

Mr. H.P., white American, age 45, preacher, Alabama, walked into the Sanitarium complaining of arthritis of left leg. Always enjoyed good health until three weeks before — no accident and no operation.

Patient complains of chills and fever and states that three weeks previously his left knee began to swell and his temperature had been 102°. The x-rays revealed a typical Charcot's joint, the Wassermann was four plus, but the patient denied ever having an initial lesion.

The patient was given anti-syphilitic treatment, plaster cast applied, and later a hinged brace was given him. He made a remarkable recovery and when last seen, although he had a disfigured knee, he was able to get along without the use of any support.

I have had two or three similar cases to this one, in the last 15 or 20 years, where they were treated early,

given vigorous anti-syphilitic treatment interrupting the progress of the disease.

Most Charcot's joints occur in patients afflicted with locomotor ataxia. They are painless, come on suddenly,

Fig. 4. Case 1.
Patient, perfectly well, at work five months postoperative

and destroy the joint rapidly unless vigorous treatment is instituted. If neglected, it may be necessary to resect the joint or amputate the limb.

CASE NO. 6. LUES. CHARCOT'S JOINT.

Mr. E.D., white American, age 46, came to Sanitarium with typical Charcot's joint of right ankle. Had large ulcer on lateral aspect of ankle. Patient suffered little or no pain with foot. The ankle was dislocated and the extremity was held at right angle. Patient had four plus Wassermann. He was given anti-syphilitic treatment with some improvement. Patient went to another State and was treated at another hospital and we were unable to follow him.

CASE NO. 7. BRODIE'S ABSCESS.

Mr. H.C., white American, age 12, Tennessee, came to the Sanitarium on June 5, 1932, complaining of pain in right knee. Mother stated he had flu with chills and fever in March, 1932. A few days later he complained of pain in the right knee and had slight chills, temperature went to 103°. He remained in bed for three weeks, during which time his knee had not swollen much, but later on it showed signs of inflammation. His most severe pain was immediately after he became sick in March. However, the patient continued to have fever until he was admitted to the Sanitarium, June 5, 1932, at which time his temperature was 99.4°, pulse 74; blood count showed mild leukocytosis.

The x-rays revealed a bone abscess in the proximal third right tibia just distal to epiphyseal line. Under general anesthesia, the abcess was opened, curetted, swabbed out with Tr. iodine, and packed with iodoform gauze. The cavity, when the operation was completed, was about two and one-half cm. in diameter. (See Case 7, Fig. 2.)

The patient was dismissed as well August 17, 1932. He returned to the Sanitarium for treatment for other conditions following operation, and the tibia has remained well as shown by x-ray taken eight years later.

Fig. 4. Case 7.
Showing old scar seven years postoperative

Summary

SEVEN cases have been reported of chronic inflammatory bone conditions. The pyogenic osteomyelitis, the Brodie's abscess, and the sclerosing osteomyelitis were all in patients less than 14 years of age.

The purulent osteomyelitis cases, the sclerosing osteomyelitis, and the Brodie's abscess were all in the diaphysis near the epiphyseal line, which is the characteristic situation for these pathological conditions. The Charcot's joint, as the name would indicate, is on the joint side of the epiphysis. No case of Paget's disease or echinococcus cyst was reported.

Two cases of the seven reported revealed pathological fractures.

Chronic bone infections are of interest to the fracture surgeon, the orthopedist, and roentgenologist. The three most important type of bone infections are pyogenic osteomyelitis, tubercular osteomyelitis, and lues.

A closer study and association between the bone surgeon and the roentgenologist will make the diagnosis easier, and lessen the morbidity in *chronic bone infections.*

Industrial Medicine
Reg. U. S. Pat. Off.

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The Sine Qua Non

YOUNGER men are beginning to appear in industrial medicine, many of them coming into it with the purpose of making it their life work. They bring to it, in all cases, the background of the education that qualifies them to practice medicine and surgery, and in many cases an experience in practice which may or may not have been partly industrial. Their point of view, therefore, is the *medical* point of view. But as they become better acquainted with the field, they discover that it has numerous elements which are not wholly medical and yet are so closely identified with medicine, as it must be practiced industrially, that there is no sharp and definite line of separation to mark them off by themselves.

Without any attempt to list them in order of importance, or otherwise, some of these elements may be mentioned. One, and the first one, of course, is the employer relation; there are now the patient, the doctor *and* the employer—the latter paying the bill. Then, within that relation, there are the administrative requirements, having their basis in the fact that industry has its economic problems — centering about the necessities that things made to be sold cost money to make, and medical service is an item of cost of making. Next might be the involvement with governmental and statutory regulations, and compensation and its attendant matters, not the least of which is the medicolegal phase. And then there is the diplomatic department, as it were, where, on the outside, the contacts are with the private practitioners—who do not always appreciate industrial requirements; and, on the inside, with the high executives—who are not always sympathetic, and the not so high executives—who, so often, from the springboards of their titles, aspire to jump at once into the wisdom that comes only after long experience. And last, but not least, is the close and continued association with the human element—which, in so many manifestations that come to the doctor's notice, is vastly different when at work from what it is when not at work.

Made up as it is of these elements and their component perplexities, industrial medicine thus must often seem confusing to the younger man coming into it. The interests and personalities, the social and political influences, and the economic causes and effects corollary to the *industrial* situation must often create the impression of innumerable greater difficulties superimposed upon a profession in which the difficulties are already great enough. The industrial physician must be capable, indeed!

This, however, is a challenge, and an opportunity. But never was one of either without the man to meet it.

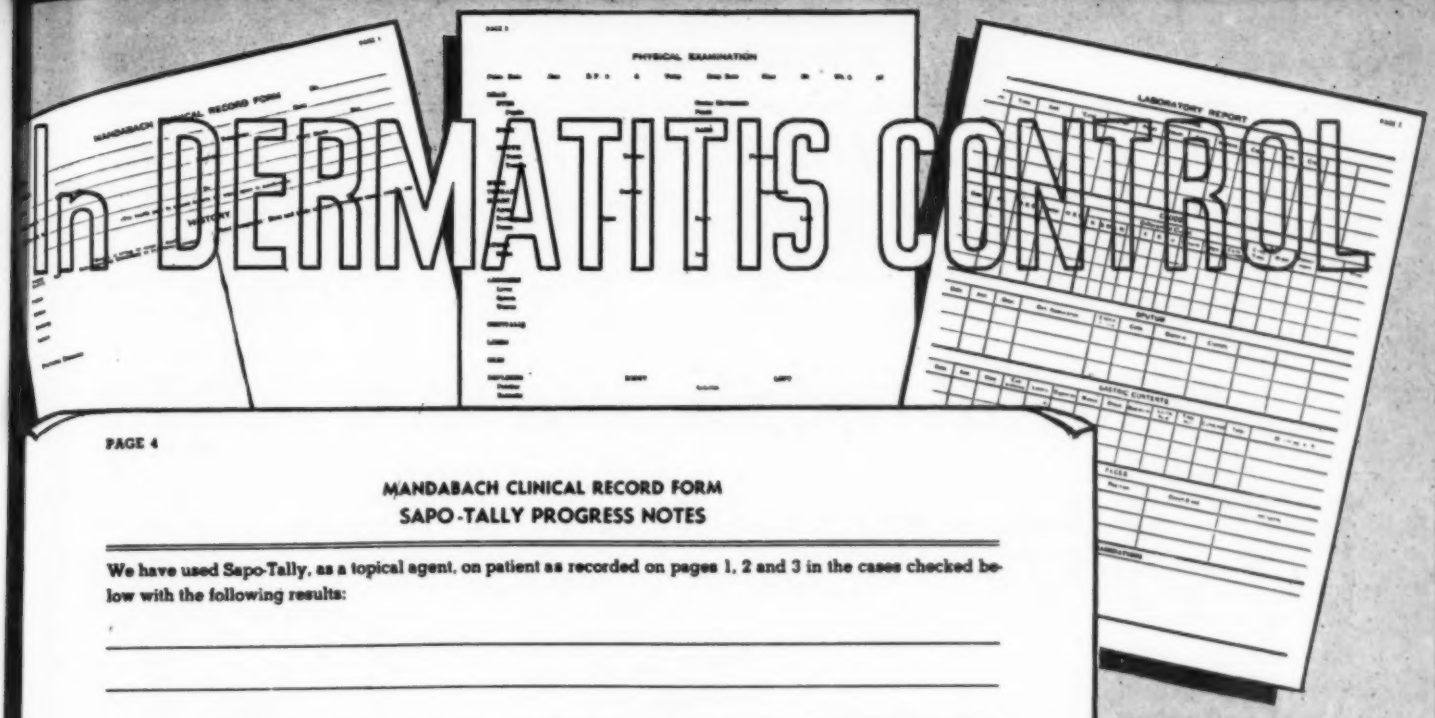
This note therefore, is not a matter of concern lest either be not met. It is only by way of observing that the doctor, from the basis of the fact that he *is* the doctor, is the one who alone possesses the *sine qua non* of industrial medicine, and necessarily of industrial health. Within the scope of all definitions of these in theory and all applications in practice he is the one without whom they are not. From the stepping stone of that assurance he must grow in whatever directions the industrial situation demands. His growth to the full measure of a career in industrial medicine will be strong and sure in proportion as he evidences the quality which, as Dr. Blosser remarks (page 283), is "known as intellectual honesty."

And no one, in training for a life work and in dedication to it, has a better foundation in just that quality than the physician.

Convention Activities

IN ADDITION to the outstanding scientific programs for the June convention—the Annual Meetings of the American Industrial Hygiene Association and the American Association of Industrial Physicians and Surgeons (pages 259-261)—the Committee on Reception and Entertainment, under the chairmanship of Dr. J. J. Wittmer, has prepared a very attractive schedule of social activities. This is given in detail on page 284. It is an invitation to "bring the family," and an expression of assurance that while the doctors are attending the sessions the ladies will be kept busy and interested. The Banquet, at 8:00 o'clock Thursday evening will be the occasion of this year's presentation of the W. S. Knudsen Award. All the Committees have been hard at work; the auspices are more favorable than ever for a better convention than ever!

In DERMATITIS CONTROL



PAGE 4

MANDABACH CLINICAL RECORD FORM
SAPO-TALLY PROGRESS NOTES

We have used Sapo-Tally, as a topical agent, on patient as recorded on pages 1, 2 and 3 in the cases checked below with the following results:

_____

_____

_____

_____

_____

_____

_____

_____

We are continuing the use of Sapo-Tally on this patient

PLEASE SEND US an additional supply of Sapo-Tally, WITHOUT CHARGE, to complete this test. Also send clinical record forms in duplicate and we will return to you further progress record as the case advances.

Name of M.D._____

Address_____

City & State_____

If in Industrial Practice: Name of Company_____

Name of Soap Purchasing Agent_____

Kindly indicate condition on which Sapo-Tally was used.

- ☐ Acne (due to external causes)
- ☐ Antiseptic Agent
- ☐ Athlete's Foot
- ☐ Barber's Itch
- ☐ Bed Sores
- ☐ Body Odors
- ☐ Other Odors
- ☐ Buffer
- ☐ Dandruff and Itching Scalp
- ☐ Furunculosis
- ☐ Germicidal Agent
- ☐ Dermatitis
  - ☐ " Cosmetic
  - ☐ " Dye
  - ☐ " Flour dust
  - ☐ " Gasoline
  - ☐ " Lime
  - ☐ " Kerosene
  - ☐ " Naphtha
  - ☐ " Paint
  - ☐ " Scouring Powder
  - ☐ " Turpentine
  - ☐ Any other types of dermatitis

  _____
  - ☐ Dry Skin
  - ☐ Eczema
- ☐ Impetigo
- ☐ Insect Bites
- ☐ Itching due to Hemorrhoids
- ☐ Mites
- ☐ Pediculosis
- ☐ Poison Ivy
- ☐ Poison Oak
- ☐ Ring Worm
- ☐ Scabies
- ☐ Skin Infection
- ☐ Surface Skin Infections
- ☐ Wound Cleansing
- ☐ Adjunct treatment to the use of hand creams, lotions, ointments, etc.
- ☐ To eliminate cross contagion of employees

The medical profession may secure additional copies of this form, without charge, by addressing MAXIMAX, INC., 159 N. Michigan Ave., Chicago, Ill.

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THESE FORMS 8½x11 (double letterhead sheet) to fit vertical files are available to Industrial Physicians and Surgeons. We invite you to request a supply on your Industrial Medicine Department stationery.

SAPO-TALLY – a medicated soap containing 1.5 gr. mercuric cyanide. Born in Industrial Clinical work in Dermatitis. If you have not received your sample package, write for one.

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159 N. MICHIGAN AVE.
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INDUSTRIAL HEALTH AND DISEASE

A Proposed Plan for the Recording of Industrial Absenteeism

AIR HYGIENE FOUNDATION

EVERY case of lost time or absence calls for inquiry. It should be properly recorded. A study of such records is certain to disclose the existence of adverse influences or circumstances, today unsuspected, which may denote the beginning of sickness." British Health of Munition Workers Committee. Sir George Newman, Chairman. (1916.)

Introduction

WHILE it is desirable that data on absences from all causes and of all durations be recorded the plan presented here is concerned principally with sickness as a cause.* It is now fairly well established that the lost time and incapacity due to sickness among workers constitute one of the most important problems in industrial hygiene. Studies which have been made, both in this country and abroad, indicate that absenteeism due to sickness exceeds by far that caused by industrial injury and occupational diseases. These findings present an important social and economic problem to those concerned with the welfare of the working population.

In this country, great strides have been made in the control of occupational accidents and specific occupational diseases. Industrial hygienists at present are focusing their attention on the importance of general health among the gainfully employed. It is realized that, in order to improve the health of workers steps must be taken to prevent or control sickness among them. However, it is also realized that, before such steps can be taken, it will be necessary first to know something of the magnitude and nature of the factors involved. Such information is vitally needed as a basis for constructive development in the field of industrial hygiene. It is obviously necessary that some one definite plan be adopted to insure comparability of results among different industries.

The plan as proposed requires the filling in of a punch card for each absence, and the recording on two forms (A and B) of the number of workers under observation. The punch card and forms are illustrated and further reference will be made to them later. The punching of the cards, the tabulation, and the analysis may be performed by the company, the State health department or some other body.

Objectives of the Proposed Plan

ABSENTEEISM records will reveal the line of action which needs to be taken to obtain a maximum reduction in the amount of time lost from work on account of disability. Excessive rates from certain causes will call for epidemiological studies and should serve to improve those conditions which may be the cause of undue amounts of disability.

In an attempt to improve the health of the worker certain statistical data should be obtained so as to yield the following basic rates:

1. Frequency Rate: Average annual number of absences per 1,000 workers.
2. Disability Rate: Average annual number of days lost per worker.
3. Severity Rate: Average number of days lost per absence.
4. Fatality Date: Per cent of cases that ended fatally.
5. Mortality Rate: Number of deaths per 1,000 workers.

With respect to absences from causes other than sickness, only rates corresponding to 1, 2, and 3 are obtainable.

All of the rates referred to should be specific for age, sex, color, department, occupation and for whatever cause.

It is especially important to obtain sickness absenteeism rates according to occupation. The incidence of pneumonia, for example, may be abnormally high for some occupations, but this condition would not necessarily be revealed were rates determined on a departmental or industry basis. Sickness rates for specific diseases in an occupational group will permit the evaluation of the effect of the working environment on health. Furthermore, such information is useful in the assessment of the efficiency of any methods which may be instituted for the control of diseases found occurring at excessive frequency. To obtain all of the rates indicated above, it is essential that the number of workers under observation (absent as well as non-absent) be known in each occupation specific for age, sex, and color.

Material Required by Plant

THE following material is required:

a. Punch cards for recording absences.

SUGGESTED PUNCH CARD FOR THE RECORDING OF AN ABSENCE
(Original size 7⅜" x 3¼")

Employee's Name (last name first)	**Name of Company**	
A. Employee's Soc. Sec. No.	J. Department	Q. Diagnosis
B. State	K. Date Absence Began	
C. City or Town	L. Date Absence Ended	
D. Industry	M. Calendar Days Absent	
E. Company Number (Federal Old Age Insurance)	N. Termination 1. Returned to work 2. Resigned or dischgd. 3. Died 4. Other, including maximum benefit 5. Unknown	
F. Color 1 White 2. Negro 3. Other		
G. Sex 1. Male 2. Female		
H. Age in Years Last Birthday	O. Reason for Absence 1. Personal Sickness 2. Non-industrial Injury 3. Industrial Injury 4. Other	
I. Occupation		
	P. Diagnosis by Physician 1. Yes 2. No	

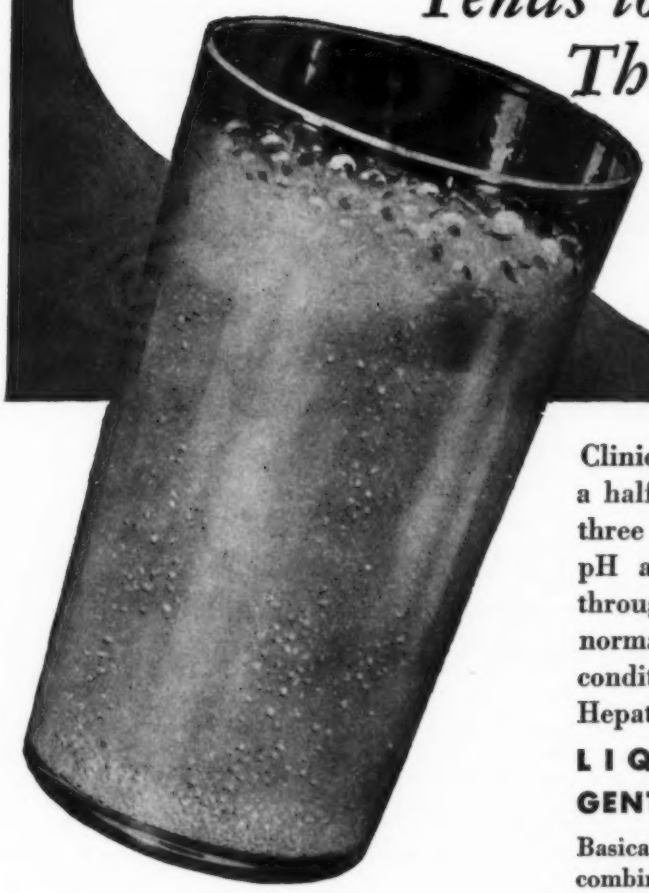
* This is a revision of "A Reference Manual on the Collection of Reports of Absenteeism Among Workers," which appeared in mimeograph form in April, 1939.

Prepared by the Division of Industrial Hygiene of the National Institute of Health, U. S. Public Health Service, Washington, D. C.

ℨss t. i. d. of SAL HEPATICA

Tends to Alkalinize *Throughout Day*

Combined with Gentle LAXATION Aids in Colds.



Clinical studies have recently shown that a half teaspoonful of Sal Hepatica two or three times a day tends to raise the urinary pH and keep this higher alkaline level throughout the day. For helping to restore normal base-balance in colds and similar conditions, this alkalinizing property of Sal Hepatica offers usefulness.

LIQUID BULK FOR GENTLE BOWEL CLEANSING

Basically, the rational saline combination of Sal Hepatica is designed to rid the constipated bowel of waste (cold or no cold). Sal Hepatica makes a pleasant, effervescent solution which provides liquid bulk for activating, flushing and lubricating the intestines. Excessive gastric acidity is neutralized and bile flow stimulated. . . . Why not request sample and literature?

Sal Hepatica

Flushes the Intestinal Tract and Aids Nature Towards Re-Establishing a Normal Alkaline Reserve.

BRISTOL-MYERS COMPANY

19XX West 50th Street New York, N. Y.

b. Form A and Form B for recording the number of employees under observation. (This number includes any employee, and only such employees, for whom a punch card would be filled in should he at any time be absent.)

Care of the Punch Cards

SINCE the completed punch cards will be punched and run through delicate machinery it is *most necessary* that the cards be handled with extreme care. Any tear, crease or other physical blemish will interfere with the running of the card through the machines. Therefore no paper clips or pins should be used, and care should be taken not to bend the cards nor rub their edges. Rubber bands or strings should not be used without protecting the top and bottom of a pack of punch cards with card board or several thicknesses of paper. Stored cards, blanks or filled ing, should be kept tightly packed in their original containers, and not stored in a damp or in a hot place.

Filling In of the Punch Cards

GENERAL Instructions: 1. All entries on the cards should be written legibly, preferably with pen and ink. A typewriter should not be used since it would injure the cards.

2. *One* card should be made for *each absence* lasting one calendar day or longer *provided* the employee would have been permitted by his employer to work on that day and provided he is a member of the group under observation, namely, included in the report forms A and B.

3. On the first day an employee (a member of the group under observation) is absent, the following items should be filled in on the punch card: Employee's name, Name of company, Social Security number, State, City or Town, Industry, Federal Old Age Insurance company number, Color, Sex, Age, Occupation, Department and Date absence began. The card should be completed when the employee returns to work, or the absence is terminated by death, removal from the payroll or by some other cause.

4. On the day recording begins it will be necessary to fill in a punch card (as completely as possible) for each employee (a member of the group under observation) who is absent on that day. At this one particular time a card should be prepared regardless of how far back the absence began, provided the employee is still on the payroll or considered an employee whether or not he is receiving pay.

Items on the Punch Card

EMPLOYEE'S name. — Enter last name first, followed by first name, and then middle name or initial.

Name of company. — Write the name of the company. (A rubber stamp could be used here and a supply of cards stamped before needed.)

A. Employee's Social Security Number. — This number should be used because it does not change.

B. State, and, C. City or Town. — Write the name of the State and City (or Town) in which the plant or establishment is located. (If a rubber stamp is used above and it includes the State and City, or Town, these spaces may be left blank.)

D. Industry. — State type of industry. The industrial classifications prepared under the auspices of the Central Statistical Board, Washington, D. C., are recommended for consideration.

E. Company number. — The Federal Old Age Insurance number should be used.

F. Color. — Circle the appropriate number.

1. White (native or foreign born).
2. Negro.
3. Other (Chinese, Japanese, Filipino, etc.).

G. Sex. — Circle the appropriate number.

1. Male.
2. Female.

H. Age in Years. — Give age in years at last birthday.

I. Occupation. — Enter the occupation in which the employee was engaged when the absence began. This occupation would correspond to the employee's occupation as given on Form B.

J. Department. — Enter the department in which the employee was engaged when the absence began. This department would correspond to the employee's department as given on Form B.

K. Date absence began. — Enter the day on which the employee's absence began, for example, 12-30-38.

L. Date absence ended. — Enter the day the employee returned to work, or the absence was ended by death, being dropped from the payroll, etc., as 2-26-39.

M. Calendar days absent. — The calendar days absent is the number of calendar days from the date the absence began to the date the employee returned to work, or until termination by death or some other cause.

N. Termination. — Circle the appropriate number.

1. Returned to work.
2. Resigned or discharged.
3. Died.
4. Other, including maximum benefit.
5. Unknown.

O. Reason for absence. — Circle the appropriate number.

1. Personal sickness (employee sick himself).
2. Non-industrial injury.
3. Industrial injury.
4. Other.

If the *Reason for absence* was marked "4," P and Q of the card will be blank.

P. Diagnosed by physician.—Circle the appropriate number.

1. Yes.
2. No.

Q. Diagnosis. — Give the name of the disease which is the primary cause of disability. All complications, concurrent diseases and sequelae should be recorded.

Note: In the statistical analyses the sickness cause groups might be classified as follows:

Non-industrial injury
Influenza and grippe
Nasal fossae and annexae
Bronchitis
Pharynx and tonsils
Pneumonia
Respiratory tuberlucosis
Other respiratory diseases
Teeth and gums
Stomach except cancer
Diarrhea and enteritis
Appendicitis
Hernia
Other digestive diseases
Heart
Hemorrhoids
Other circulatory diseases
Genito-urinary diseases
Neuralgia, neuritis, sciatica
Other diseases of nervous system
Organs of vision
Ear and mastoid process
Rheumatic diseases
Lumbago, myositis, etc.
Skin diseases
Infectious and parasitic diseases
Cancer, all sites
Other nonrespiratory-nondigestive diseases
Ill-defined and unknown causes
Pregnancy
Industrial injury

Filling in Forms A and B

FORMS A and B are essential since they provide the population base upon which the various specific rates can be calculated. It is very important that they be prepared with great care and to make sure that the number of employees recorded on Forms A and B includes only such employees for whom punch cards would be filled in should they at any time be absent. Failure to observe this caution might result in a fictitious reduction in rate caused by the inclusion of more employees than were subject to absence recording.

Form A.—Average number of male and female employees by months should be filled in at the end of each recording period, including only those months comprised in that particular period. The method used to obtain the average and the source of information pertaining to the employees under observation should be selected with the objective of securing the maximum degree of accuracy. For example, if there was not a large

amount of labor turnover the average is generally obtained by a count on the first and the middle of the month, which when added together and divided by 2 would give the desired result. If there was a sick benefit organization which did not include all employees, it might be necessary to make the count from the sick benefit organization records rather than from the total payroll.

Form B.—Number of employees according to age and color by occupation and department gives the data upon which specific rates can be calculated. A Form B is filled in for each sex. Since the constitution of the employed population of any particular plant is likely to remain fairly constant it is not necessary to make this detailed count at the end of each recording period; instead probably annually or bi-annually would be sufficient. *During the intervening period the proportions with respect to sex, age, etc., calculated from Form B can be applied to the data on Form A.* Care should be exercised that the age, color, sex, occupation and department in which an employee is counted on Form B should correspond with the age, color, sex, occupation and department which will be entered on the punch card if the employee be absent.

Conclusion

THIS proposed plan for the recording of absenteeism among workers is intended as a stimulus to discussion and experimentation which it is believed will lead to a standard system of recording.

Additional experience is particularly needed concerning the kind of industrial classification best adapted to absenteeism recording. The "Industrial Classification" proposed by the Central Statistical Board, Washing-

Form A

AVERAGE NUMBER[1] OF MALE AND FEMALE EMPLOYEES BY MONTHS

Name of Company.....

Location..... (Address)

Industry..... Year 19.....

Month	Average Number of Employees	
	Male	Female
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

1. This number includes any employee, and only such employees, for whom a punch punch card would be filled in should he at any time be a sent.

Signed.....

Position.....

Industrial Absenteeism, A. Date.....

Form B

NUMBER OF ALL[1] EMPLOYEES OF DIFFERENT AGES AND COLORS BY OCCUPATION AND DEPARTMENT

Name of Company..... Location (address)..... Industry.....

Age distribution of employees as of....., 19.... [2]Sex.....
(Month)

Occupation	Department	All ages			Age in Years																
					Under 25			24–34			35–44			45–54			55–64			65 and over		
		W*	N*	O*	W*	N*	O*	W*	N*	O*	W*	N*	O*	W*	N*	O*	W*	N*	O*	W*	N*	O*

W*—White. N*—Negro. O*—Other.

1. This number includes any employee, and only such employees, for whom a punch card would be filled in should he at any time be absent. 2. Report only one sex on each sheet. Please designate whether Male or Female.

Signed..... Date.....

Industrial Absenteeism, B. Position.....

ton, D. C., should be followed in general outline, but the grouping within the broad classes will require careful study. Likewise an occupational code which will be sufficiently detailed and yet not too cumbersome has yet to be devised. In this instance also the Central Statistical Board has in preparation a code which should be of assistance. At the present time it seems desirable to describe each occupation in as complete detail as posible. For some companies a classification by department alone, without occupation, may be satisfactory. The ultimate aim, however, should be to develop an occupational code which will fit the needs of all companies.

Information in detail should be secured with respect to the rules and regulations governing absences from each company before any inter-company comparisons are made. It is important to know the coverage of reporting in each plant; whether groups of employees of certain occupations, ages, or physical condition are excluded; whether payment is made for absences and, if so, whether this payment represents full wages or part wages; and whether there are benefits from sick benefit organization funds or sickness insurance. Not only should the scale of payments be ascertained, but also the length of time such payments are made. Methods of recording the termination of absences should be examined with the object of discovering whether arbitrary time limits are applied with the result that absence records are cut off while some individuals are still unable to work.

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Problems in Industrial Medicine, Some Social and Economic Aspects

H. L. Blosser, M.D.,
Portland, Oregon

OF THE various problems not strictly medical in character which face the profession today, none has met with such lack of uniform policy and interest as that of industrial medicine. This differs from ordinary medical practice because of the interposition of a third party between the patient and physician. This third party has a direct interest in the doctor-patient relationship because he is responsible for the remuneration of both; on the one hand, for the payment of compensation, and on the other hand, for the payment of professional services.

The social and economic problems of industrial medicine may be roughly separated into five divisions: the problems of (1) the workman, (2) the employer, (3) the medical profession, (4) the insurance carrier, either state or private, (5) the public.

It is the purpose of this paper to show that the medical profession must be directly concerned with the whole problem of industrial relationships, even though some of them at first sight would seem to concern it only remotely.

Problems of the Workman

INADEQUATE coverage for industrial illness as distinguished from industrial accident. Beginning with lead poisoning, which has long been recognized as a direct industrial illness, some legislation has been directed toward protection of the workman from illness since 1883. As would be expected, laws and regulations concerning industrial illness are more complete in the areas where chemical and manufacturing industries predominate, but only twenty-four states have such laws at the present time.

Oregon is inadequately provided with a means of defining industrial illness and providing compensation therefor. It was not the purpose of the creators of the present industrial act to include industrial illness. The present law provides compensation for "accidents sustained through violent and external means, arising out of and in the course of employment." The Oregon Supreme Court has held that poison oak dermatitis is an industrial accident and, therefore, compensable; and this, along with certain other rulings, has resulted in altering the situation so that an accident is not necessarily what the industrial act declares, but is what the Supreme Court interprets the act as declaring.[1]

Several attempts have been made in Oregon to include industrial illness under the compensation act, and the administrators of the act feel that this should be done. The chief obstacle in recent legislative attempts to do this has been the insistence of labor that final decisions on compensation and disability shall remain with a lay-jury as the accident controversies now remain; and the employer group, rather than to submit to this notoriously inefficient procedure has succeeded in defeating the industrial illness measure in the legislature.

Washington is much more adequately covered for industrial illness than Oregon by its act of 1937, which pays compensation for anthrax, lead poisoning (and other heavy metals), benzol, tetrachlormethane, and other chemical substances, carbon monoxide poisoning, bursitis, industrial dermatitis, silicosis, and many other diseases, all of which are defined.

2. *Insufficient compensation for time loss from accident.* Many workmen engaged in hazardous or even nonhazardous occupations often find themselves, through no fault of their own, suddenly reduced to approximately one-half of their earnings by reason of an accident. This, in many instances, reduces his income to a point of bare subsistence. The compensation rate in Oregon is computed as shown in the table below:

1. Bannister vs. State Industrial Accident Commission, 142 Oregon 97.

	Per cent of wages	*Max per mo.*	*Min. per mo.*
Workman, single	40	$55	$30 or the wage.
Workman and wife	48	65	40 or the wage.
Workman, wife, and one child	53	73	
W, W, and 2	58	81	
W, W, and 3	63	89	
W, W, and 4	66⅔	97	

3. *Insufficient compensation for permanent partial disability.* In Oregon, a man receives $2400 for loss by amputation of his arm above the elbow. In Washington, he receives $2280. From that time on he is doomed to light work and will be often unemployable. He will lose thousands of dollars in earnings and may even eventually become dependent upon society. If this $2400 were paid at the rate of $50 monthly, it would last for only forty-eight months. What is to become of him after that time? It is true that many men with such a disability eventually rehabilitate themselves and find useful steady employment, but it is equally true that some never do. At the present time, there is no provision for partial disability payments after the specified sum has been paid out and there should be some method whereby these disabled workmen could obtain some permanent monthly payment for life or during periods of unemployment and need, due to their reduced earning power. If some of the other financial problems could be adjusted, legislation to correct this could be passed and the burden for industrial derelicts placed where it belongs, on industry.

4. *Industrial safety.* Publication of the Oregon Logging Code in 1937 and the inspection carried out by the State Industrial Accident and Labor Commissions in this and other industries has produced great improvement. There is room for further progress and the work must be pushed in an efficient manner. The time to treat an accident is before it happens, and industrial safety is still too widely neglected.

5. *Adequate protection of the workman's right of free choice of a physician.* This right has been subjected to criticism by employers and insurance companies, and contracts are habitually being made which deny the workman any choice. While it is by no means a fact that the patient is always the most competent judge of the capability of a physician, it is equally true that an arbitrary hospital contract does not furnish the most efficient care. The patient often feels that he is being discriminated against and that the "company physician" will favor the employer at the workman's expense. It is one of the most important principles of the medical profession that the patient be allowed free choice of physician.

6. *Irresponsible employers.* Another problem which the worker faces is that of the so-called "jippo" logging concerns and other irresponsible employers who hire labor and make no provision for medical care or compensation. If injury results, they inform the workman that they have no insurance and no money with which to pay bills, and for him to sue, if he thinks he can collect. This leaves the man responsible for his own expenses, often disabled and obviously unable to compensate either the hospital or the physician, with

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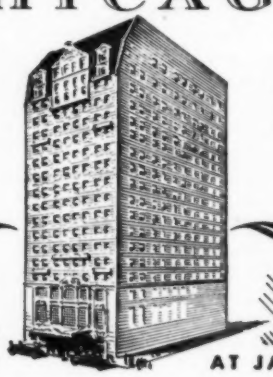

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the result that all three suffer for the irresponsibility of a dishonest employer. It may even extend further and result in the workman becoming dependent on society so that the employer could save the amount required for compensation costs. The laws controlling this should be strengthened so that this cannot take place.

7. *Inadequate coverage rendered by unscrupulous insurance companies* who obstruct, as far as possible, the attempts of an injured man to secure compensation.

Problems of the Employer

THESE are largely financial, and as such are beyond the scope of this paper. They consist of the rising cost of protection, the reasons for which are discussed later. These costs have doubled in Oregon in the past ten years, and if they continue to rise, there is a grave possibility that it may lead to the break-down of the state compensation systems.

Problems of Medical Profession

SECURING *adequate income for professional services rendered.* Fees have often been arbitrarily allotted without consulting the doctors to whom they were paid. The physician has as much right to proper return for his services as any other person, and it is his right to insist on protection of the funds of the commission by businesslike administration.

2. *Reasonable protection of private practice against contract agencies.* Contracts, particularly those entered into by lay-owned hospital associations, are secured by unethical competitive methods which the private physician cannot and will not imitate. These associations employ physicians at nominal salaries and then contract many times the proper amount of work for them to do. These associations are not in the best interests of the medical profession, and this type of practice must be stopped. So far, only partial steps have been taken, and there are still many physicians who are working for lay-hospital associations. Many other "ethical" physicians, i.e., members of the American Medical Association and component societies, by serving as consultants, give them an air of respectability, serve as one of their talking points in the solicitation of contracts and make their continued existence possible. The whole system of contracts for medical services must be revised.

3. *A more adequate understanding of disability estimation by the profession and some means of standardization thereof.* The amount of time loss a workman should have for an injury and the amount of permanent disability he has sustained are very poorly understood by the profession. While these must necessarily be a variance of opinion in such a complicated field, the inadequate handling of disability estimation has been due to apathy and lack of opinion rather than simple variance. The medical profession owes it to the accident commissions and insurance companies to familiarize themselves with the fundamentals involved. The present lack of agreement between physicians gives rise to difficulty in settling cases and to unnecessary litigation. It is during litigation especially that the difference of opinion between doctors becomes so glaringly apparent. This forces the courts to make their own interpretations and is responsible for charges of dishonesty and the opinion that a physician can be secured to testify to anything if the price is right. It behooves the profession to scrutinize this deficiency and to go into the matter carefully, to be able to present medical cases logically and in a scientific manner in court or arbitration proceedings.

Problems of the Insurance Carrier

THE following must necessarily apply largely to the State Industrial Accident Commission of Oregon, because this insurance represents approximately 90% of the industrial insurance coverage of the state. The history of compensation is not in order here, nor is a detailed compari-

son of other methods of providing compensation for accidents suffered in the course of employment. Suffice it to say that there are four methods of insuring the workman.

1. *Self-coverage.* In this method, the employer chooses to take the responsibility himself, paying out to no one and paying medical expenses and compensation out of his own pocket, if and when accidents occur to his workmen. If this method is permitted, it should be required that he be adequately bonded.

2. *Private insurance.* In this, an insurance company undertakes, for a stated consideration, to cover the risks pertaining to a given industrial operation and assumes all payments to those injured, for time loss, medical services, hospitalization, and permanent disability.

3. *Some form of state or government commission* which assesses the employers coming under its coverage a given amount, thus creating a fund from which expenses and compensation payments are made. This is essentially a non-profit organization, subject to legislative control, and the assessments to the employers can be so adjudicated as to meet the expenses.

4. *Recovery at common law.* This is the oldest method of workman protection, and it is this which our various state industrial bodies were created to replace. It is an unsatisfactory means of coverage in most instances, because it depends for its manner of settlement on the skill of opposing attorneys to present a case to thirteen people who know very little about what they are being asked to decide, leaving too much to chance and too little to the real merits of the case.

In settling industrial disputes at common law there are many disadvantages to the workman, physician and employer. Among the disadvantages to the workman there are the oft-interposed defenses of contributory negligence of the workman himself, of a fellow-workman or of a third party to divide the responsibility so that recovery could be made from neither; by the "freeze out" method, by which the case could be delayed and appealed by an unscrupulous employer until the capacity of the workman to continue the case was exhausted. Added to this is the dissatisfaction of the workman when small awards are made by a hostile jury, and the dissatisfaction of the employer when large awards are made by a sympathetic jury. Furthermore, many cases have been, in the past, lost by the legal conception of "assumption of risk," whereby a workman engaged in a hazardous occupation was understood to accept these hazards and, therefore, to be unable to recover in case of accident.

The physician was likewise placed in a very unsatisfactory position because, if no recovery was made, the workman either could not or would not assume responsibility for payment. In other instances, the workman would take the settlement and spend it, letting the doctor go unpaid.

Returning to the accident commission principle, let us consider the Oregon State Industrial Accident Commission. This originated in 1913,[2] was placed on a working basis in 1914, and has been in operation for twenty-five years. These years have seen many changes in the attitude of labor and of the American people which have been brought about by the great financial depression, through which the country has passed and have in part been fostered by a paternalistic government. Formerly, there was a high sense of self-reliance which seems to have been converted, in a considerable proportion of the population, into a feeling of dependence on some government controlled institution, and a "the world owes me a living" attitude. The period has been characterized by the great problem of unemployment, by work relief and other schemes to relieve the pressing financial problems of the completely or partially unemployed. Unfortunately, it has also been characterized by a widespread demand for government pensions of the "thirty dollars every Thursday" type.

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2. Washington Commission was established in 1911; Idaho Commission in 1917.

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"personal injury by accident arising out of and in the course of his employment caused by violent or external means." It provided payments for temporary total disability, permanent partial disability, permanent total disability and death. It based the amount of compensation on the marital status and number of dependents. The rise of unemployment and subsequent acquisitive attitude of the public has resulted in new problems for the commission.

These problems are analyzed at this time under six headings.

1. *The purpose of the industrial act is to compensate a workman for time loss suffered by reason of accident.* It was believed that the person most likely to know when an injured workman was ready to return to work was the physician who cared for him. Consequently, forms were sent out on which medical reports could be rendered and permanent partial disability estimated if it existed. However, with the coming of the depression and widespread unemployment, it became increasingly difficult for the doctor to recommend closure because of the protests of the workman that he was not ready to go to work. This resulted in carrying of cases long after objective signs had disappeared. In spite of the inadequacy of 40 per cent of a man's wages, as discussed above, it is quite evident that this might well be more than 100 per cent of the total wages if out of employment, and it might be as much or more than the man was making if only sporadically employed.

This, with other factors, resulted in increasing time loss in the average case from $44 per case in 1928 to $76 per case in 1938, an increase of 73 per cent. It has resulted in appeals by the score, in rehearings, law suits and threats of law suits, with the intrusion into the picture of the attorney, with lay juries deciding the termination of time loss and the amount of disability rather than the physician. In any legal controversy on permanent disability, all that is necessary for an unscrupulous attorney to do is to demand 100 per cent of the loss of function of an arm or leg, perhaps on purely subjective symptoms, or perhaps supported by a professional medical testifier. The commission is then on the defensive to disprove this, while the natural inclination of the jury is usually to favor the workman, on the ground that the commissions and insurance companies are well provided with money. This practice results in robbery of a fund set up to provide legitimate compensation.

Much of this is due to the reluctance of the physician to terminate time loss as long as the patient professes inability to work, lest he antagonize the patient and perhaps his family and those whom he influences. This has necessitated the setting up of an expensive system of medical examination to assist the commission in passing on the ability of a workman to work. This could be minimized by careful attention of the individual physician to the estimation of disability and the rendering of competent reports. There is at present too much tendency for the physician to shift the responsibility to the commission. It is not implied that the physician should be a watchdog for the commission, but merely that he render comprehensive, intelligent reports. As it is, closure is often determined solely by the vigor with which the claimant resists closure, and not by the actual merits of the case. This is especially applicable in cases with a high degree of subjectivity as back sprains, sacroiliac strains and similar conditions.

2. *Demands for "settlement" at the termination of the period of Temporary Total Disability.* Many workmen feel that when they are ready to return to work they should have a "settlement," regardless of the severity of the injury or the completeness of the recovery. The purpose of the partial permanent disability award was to compensate for permanent loss of a part or function of a part, and to this end a comprehensive schedule was laid down, specifying the sum to be awarded for the loss of an arm, leg, eye, etc. It soon became apparent that many injuries,

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such as back sprains and head injuries, would not fit this schedule. These must, at present, be rated in terms of an arm or a leg.

One of the major problems of the commission is to get physicians to agree even approximately on the extent of PPD in the so-called "nonscheduled" injuries. The estimation of disability is the physician's responsibility and should not be delegated to nonmedical juries and nonmedical accident boards. In case of a true inability to decide the question, as in some special field, a physician should ask for consultation. If the workman is dissatisfied with the rating, he should seek independent medical opinion and the matter should then be submitted to arbitration by these physicians and recommendation made to the commission. This would keep both the matter of time loss and disability on a scientific instead of a sentimental basis. The present system results in scheduled injuries being settled without argument because they are carefully defined, while partial injuries involving the same member are settled for a badly disproportionate sum with the workman often subsequently making a practically complete recovery.

3. *Theory of aggravation and lowered resistance.* This is one of the most vexing and most expensive problems of the commission. The Supreme Court of Oregon held several years ago[3] that a death resulting from an admitted fatal disease was compensable, if it could be shown that the resistance of the decedent had become lowered by reason of accident and, if the workman's life had been shortened by only one day, the beneficiary was entitled to complete fatal award. Furthermore, the responsibility for deciding this rests with a jury if the case is appealed. Under this ruling, the commission has paid thousands of dollars of its money for cancer, tuberculosis, Bright's disease, arthritis, arteriosclerosis and

3. Elford vs. State Industrial Accident Commission, 141 Oregon 284.

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many other diseases which were alleged to have been aggravated by accident. In case of fatal termination it has frequently not even been reported until the patient had died, when it may occur to some member of the family that a blow which is alleged to have occurred several months prior, certainly was the cause of the whole illness and will then find some attorney and perhaps a physician to support the contention.

It is as unreasonable to expect an accident commission to be wholly responsible for a fatal disease aggravated by an accident or, for that matter a nonfatal disease, as it would be to expect the physician to be responsible for it. There has at times been every reason to believe that in certain of these cases employment was deliberately sought with the purpose of getting in on a defenseless accident commission, when other insurance was not available. If this practice is pursued too far, it will eventually result in a demand from employers for complete examination of every employee and will result in the exclusion of many men now able to work, but who, by reason of some disease or previous accident, present a slightly greater likelihood of reinjury or illness. It is, even now, not uncommon for certain employers to refuse to reemploy a man injured in their own plant because of the possibility of reinjury. This forces the workman to seek other employment and frequently, in the meantime, he expects to be carried on total time loss.

4. *Problem of the aged.* There are many people carried by various industrial compensation boards every year, whose chief problem is old age. Some trivial injury has served to put them just over the border of employability and they were fortunate enough to have employment at the time of this injury, thereby coming under the provisions of the act. While the aged obviously must be cared for, it is not incumbent on industrial boards to be the agency through which this care is given. Society must provide some form of old age relief for those who have been unable to save enough on which to retire, when their ability to work is impaired by the infirmities of age. This burden is a general social problem, and should not be placed on one division of society alone.

5. *The Professional racketeer.* These are pseudo-workmen who manage to secure employment long enough to affect an injury and then remain on industrial compensation. Records of industrial boards reveal whole families of industrial reliefers who point with pride to some place which aches and defy any medical examiner to prove otherwise. Records of the Oregon Commission reveal individuals with as high as forty-five claims for compensation. Many find the accident commission a convenient source of income for the winter. Investigations of some of these cases reveal the fact that they have moved to the Northwest from other states after they had exhausted their racket there.

6. *The unemployed.* These are people in periodic employment who are legitimately injured while working, but on recovery find their jobs are gone and try to prolong compensation. This is especially common among the seasonal workers, of whom the orchard industry is an excellent example.

Problem of the Public

THE recent social upheaval has focused attention of the public on many social problems of far-reaching nature, of which industrial relationships is only one. The chief interest of the public is financial, and one of concern lest various industrial derelicts be placed on tax-sponsored forms of relief rather than on industry, where they belong. There are many other ramifications, but they cannot be elaborated further here.

Suggested Improvements

WHAT are the remedies for the various problems outlined above, and how can the medical profession help in bettering the situation? Many are of a social nature, and better times will solve them automatically. The social reforms which are in the making will solve two of them, by rendering adequate aid to the aged and the unemployed and in assisting people partially disabled by nonindustrial diseases.

Revision of existing acts by the legislature, correcting defects and defining provisions of the act more sharply so that there will be less opportunity for litigation is essential. Racketeers must be eliminated by prosecution when the law has been infringed upon. A flat fee for attorneys, rather than a percentage of the increase in compensation, would render industrial cases less attractive to the racketeering type of attorney and would be in the same spirit as the present flat fee for medical services.

Another thing which will result in improvement is the eventual natural revulsion of the public against continued compensational rackets. Eventually the industrial racketeer will fall into as much disrepute as the racketeer who attempts to obtain compensation from "railroad spine," malingered dislocations, breach of promise and alienation of affection. The profession can be of great assistance by insisting that it alone has the knowledge to evaluate industrial disabilities and fix time loss, and by training itself so that this insistence be actually true. The future of compensation boards is indeed dark, if the many leaks referred to above are permitted to continue. So far, solvency of the funds has been reasonably well maintained by continued raising of employers' rates. However, there is already widespread dissatisfaction at the continued rise, and the cost is becoming practically prohibitive to some industries. Already some have rebelled and chosen other forms of coverage and, unless something can be done, the very existence of state compensation will be endangered.

If, on the other hand, these practices can be stopped, it will be possible to increase the amount paid workmen with definite permanent disability, to lower rates to the employer, and at the same time the physician will find that it will be possible to do away with the reduced fee schedule, under which he has been working. A great responsibility rests on the medical profession, one which calls for a large amount of that quality known as intellectual honesty.

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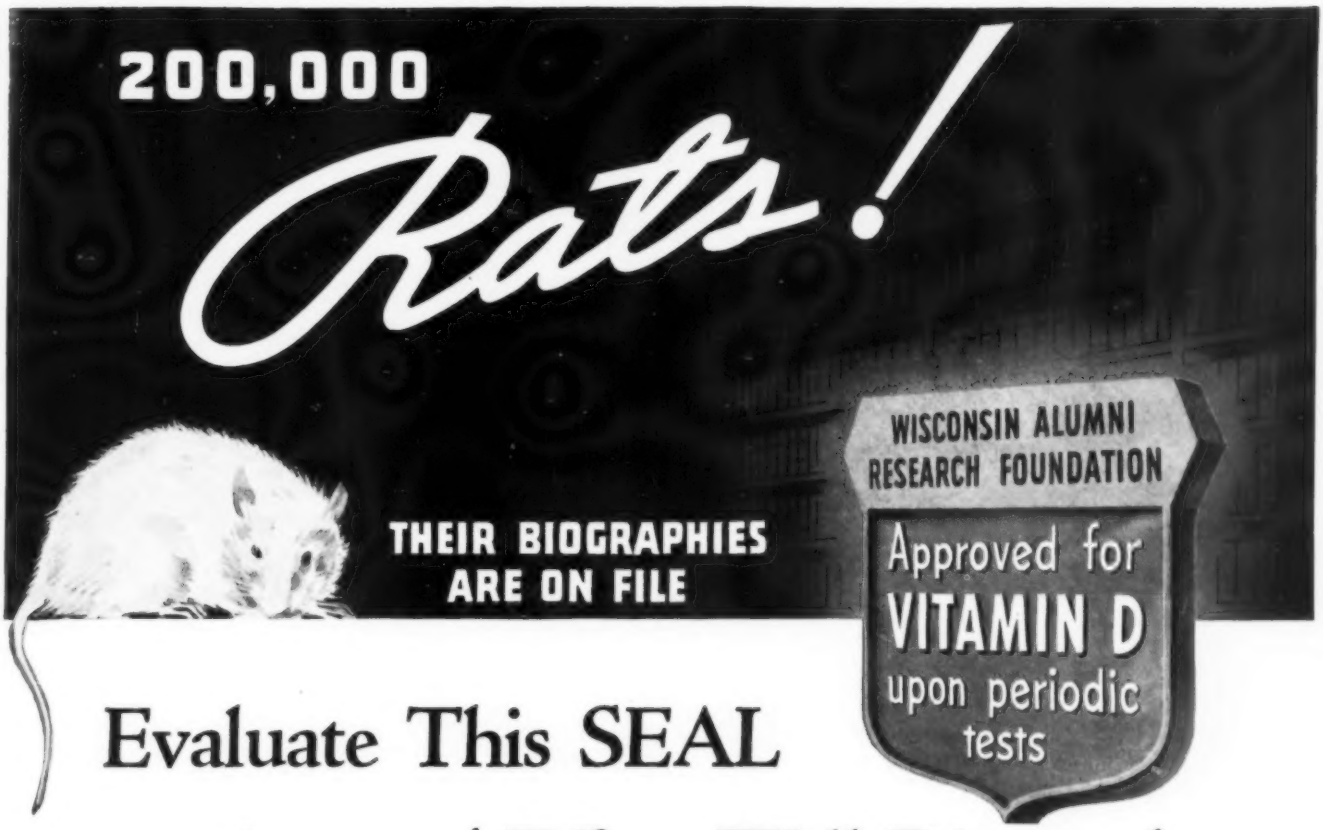
10:30 P.M.—American Jubilee Show, World's Fair Grounds.

Special Day Tickets

SPECIAL DAY 50¢ COMBINATION TICKET—giving admission to the Fair Plus admission to one concession plus 50¢ in Discount Coupons. These discount coupons, in 5¢ denominations, are good on the date specified for face value in part payment on basis agreed upon, for admission to attractions or for merchandise, wherever notice is posted to that effect. This Special 50¢ Combination Ticket is available in lots of 300 or more at 50¢. Tickets will be good for Wednesday, June 5, and Friday, June 7, and will bear the Organization's name. For reservations address Dr. J. J. WITTMER, 4 Irving Place, New York City.



Evaluate This SEAL

in terms of Effort Well Directed

Ultimately all value relates to effort. A criterion of the scientific significance of this Seal is found in the 300 volumes of reports in the Laboratory of the Wisconsin Alumni Research Foundation. Each volume contains 200 pages, thus some 60,000 pages of records are on file, covering tests made on rats since 1930, in control work on various Foundation-licensed Vitamin D products.

A minimum of seven rats for each test is required by U.S.P. standards for bioassay on Vitamin D. Each one undergoes a period of special feeding of 21 to 28 days, after which the "Johns Hopkins line test" is made. During the last ten years, 200,000 rats have been used in the Foundation Laboratory, for routine tests on licensed Vitamin D products, milks, foods and Vitamin D medicinals—some factory samples, some purchased in the open market. Licensees, also, in their own laboratories, are constantly conducting similar tests and research, to assure that their products carry the proper Vitamin D potency.

20,000 rats per year, supplies, general laboratory expense and man-power, $300,000 for testing products and for clinical research, all these when translated into terms of carefully directed effort give definite and forceful meaning to the wording on the Foundation's Seal. Products carrying this Seal, or other reference to the Wisconsin Alumni Research Foundation have been periodically tested by the bioassay method and can be relied upon to contain Vitamin D of the standard potency and uniformity. All licensed Vitamin D products are tested regularly, whether or not the Seal appears thereon.

ABOUT THE FOUNDATION

The Wisconsin Alumni Research Foundation was organized in 1925 to accept and develop voluntarily assigned inventions of a patentable nature made at the University of Wisconsin. All net avails resulting from licensing arrangements are devoted to research in the natural sciences under University direction. The Trustees of the Foundation, all alumni, render gratuitously a most valuable service to the Foundation and to their alma mater. The first discovery assigned to the Foundation was announced by Dr. Harry Steenbock in 1924, relating to the synthesis of Vitamin D in certain substances by ultra-violet irradiation. Licenses for the use of this method were granted only after careful experiment and research had determined the value of irradiated products. Subsequently other discoveries have been assigned to the Foundation.

A more detailed account of the Foundation's history, purposes and work is contained in the pamphlet "Scholars from Dollars," a copy of which will be sent you upon request.

WISCONSIN ALUMNI RESEARCH FOUNDATION, MADISON, WISCONSIN

SOCIAL SCIENCES

FEWER INJECTIONS

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Adequate estrogenic effects by means of fewer injections are desirable for many patients requiring treatment for long periods of time. Because of the prolonged effect, per milligram or fraction thereof, of this estrogenic substance, DI-OVOCYLIN* (the dipropionic acid ester of α-estradiol) is therapeutically effective with injections at longer intervals. It thus affords greater convenience, economy, and comfort to your patients.

In many cases of menopausal syndrome, senile vaginitis, pruritus vulvae, genital infantilism, and dysmenorrhea and amenorrhea associated with uterine hypoplasia, Di-Ovocylin, *"Ciba"* is the therapy of choice. For short periods of treatment or when dosage is to be altered frequently, Ben-Ovocylin,* *"Ciba"* (α-estradiol benzoate) may be injected, or Ovocylin,* *"Ciba"* (α-estradiol) administered intravaginally, by inunction, or orally.

LITERATURE ON REQUEST

* Trade Mark Reg. U. S. Pat. Off. Words "Di-Ovocylin," "Ben-Ovocylin," and "Ovocylin" identify the products as α-estradiol dipropionate, α-estradiol benzoate, and α-estradiol respectively of Ciba's manufacture.

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